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(54) **Fuel pump module**

Brennstoffpumpenmodul

Module de pompe à carburant

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates particularly to a fuel pump module used in automobile and the like.

[0002] A conventional fuel pump module comprises a reservoir formed in a lower case, a pressure regulator fixed in the lower case, and an upper case capped on the lower case. The pressure regulator is held and fixed in the lower case by a connecting member, and the reservoir and the pressure regulator are connected to each other via the connectingmember so that pressure of fuel flowing through a pipe of the pump module is regulated to be constant by the pressure regulator. The pressure regulator is fixed not only to the lower case but also to both of a strainer (filter) and the reservoir.

[0003] Furthermore, the fuel pump, the strainer and the like are held by the upper case to be capped on the lower case, and a conjunction cover is assembled into the upper case to connect one ends of a fuel pump and the strainer to each other. As a result of this, a fuel passage provided in the conjunction cover is connected to an outlet of the fuel pump and an inlet of the strainer. EP 0.959.241 describes such a fuel pump module.

[0004] On the other hand, for instance, Japanese Patent Laid-open No. 11-264356 discloses an electric pumping apparatus. This electric pumping apparatus comprises a composite connection unit provided at a fuel pump by integrally forming a discharge pipe and a coupler, a fuel pipe to be connected to the discharge pipe, and a counterpart coupler formed integrally with the fuel pipe to be connected to the coupler. This structure achieves miniaturization of the fuel pump.

SUMMARY OF THE INVENTION

[0005] However, in the prior art as described above, since the pressure regulator is fixed in the lower case by the connecting member, the number of parts constituting the fuel pump module increases. Furthermore, since the pressure regulator is fixed by only the connecting member, vibrations caused by driving a vehicle easily affect the pressure regulator. Therefore, there is the drawback that, during running of the vehicle, the pressure regulator comes into contact with the lower case due to the vibrations, which causes generation of a noise (abnormal noise).

[0006] Furthermore, in assembling the conjunction cover into the upper case, it is necessary to position the outlet and the inlet with respect to the fuel passage, and the conjunction cover with respect to the upper case, so that assembling operability of the upper case and the conjunction cover reduces.

[0007] On the other hand, in another prior art as described above, since the fuel pump is further miniaturized, the composite connection unit is miniaturized correspondingly. Therefore, it is necessary to miniaturize also the counterpart coupler as corresponding to the coupler of the composite connection unit. As described above, by miniaturizing the coupler and the counterpart coupler, producing both the couplers becomes difficult, and the operation of fitting and electrically connecting both the couplers to each other requires much time and effort.

[0008] Moreover, miniaturization of the coupler and the counterpart coupler is limited because of layout of the fuel pump. For this reason, there is the drawback that the fuel pump cannot be miniaturized to a desired size.

[0009] Furthermore, as the fuel pump module becomes small, parts constituting the pump module become also small in size, so that there is the drawback that holding power for holding the strainer, the pressure regulator, the fuel pump, and the like decreases.

[0010] An object of the present invention is to provide a fuel pump module in which the number of parts thereof is reduced, which is not easily affected by vibrations of a vehicle, and in which the assembling operability is improved.

[0011] Another object of the present invention is to provide a fuel pump module capable of easily connecting the coupler and the counterpart coupler to each other even if the fuel pump is miniaturized.

[0012] Still another object of the present invention is to provide a fuel pump module which has the improved holding power of holding at least one of the fuel pump and the pressure regulator.

[0013] A fuel pump module according to the present invention, having a reservoir formed on an inner surface of a lower case, a fuel passage for guiding fuel accommodated in the reservoir to an engine, a pressure regulator held in the lower case and regulating fuel pressure of the fuel flowing through the fuel passage, and an upper case capped on the lower case, comprises a installing portion provided inside the lower case and within the reservoir; and a pressing portion provided inside the upper case so as to project therefrom, the pressing portion corresponding to the installing portion, wherein the pressure regulator is sandwiched between the installing portion and the pressing portion.

[0014] According to the present invention, the installing portion is provided on the inner surface of the lower case and inside the reservoir. Therefore, when the upper case is capped on the lower case, the pressure regulator is sandwiched and fixed between the installing portion and the pressure portion.

[0015] Also, the fuel pump module according to the present invention is one that an auxiliary passage is provided to connect the installing portion to both of the fuel passage and a strainer for purifying the fuel.

[0016] According to the present invention, the auxiliary passage is provided between the installing portion and the fuel passage and between the installing portion and the strainer. Therefore, by installing the pressure regulator to the installing portion, the pressure regulator

is automatically linked to both of the fuel passage and the strainer via the auxiliary passage.

[0017] Furthermore, the fuel pump module according to the present invention is one that return fuel from the pressure regulator held and fixed by the installing portion and the pressing portion is returned to the reservoir.

[0018] According to the present invention, return fuel from the pressure regulator is returned to the reservoir. Therefore, provision for the reservoir prevents the fuel accommodated therein from being discharged outside the reservoir.

[0019] Moreover, the fuel pump module according to the present invention is one that an auxiliary passage is provided to connect the installing portion to both of the fuel passage and a strainer for purifying the fuel, and return fuel from the pressure regulator held and fixed by the installing portion and the pressing portion is returned to the reservoir.

[0020] According to the present invention, the auxiliary passage is provided between the installing portion and the fuel passage and between the installing portion and the strainer. Accordingly, by installing the pressure regulator to the installing portion, the pressure regulator is automatically linked to both of the fuel passage and the strainer. Return fuel from the pressure regulator is returned to the reservoir. Therefore, provision for the reservoir prevents the fuel accommodated therein from being discharged outside the reservoir. At this time, the pressure of fuel to be transmitted to the fuel passage is regulated by the pressure regulator, and if the pressure regulator has excess fuel therein, the excess fuel is returned to the reservoir.

[0021] Furthermore, the fuel pump module according to the present invention is one that a longitudinal direction of the pressure regulator is approximately parallel to an inserting direction of the pressure regulator into the installing portion.

[0022] According to the present invention, after the upper case is capped on the lower case, the pressure regulator is sandwiched between the installing portion and the pressing portion in the condition that the longitudinal direction thereof is set to be approximately parallel to the inserting direction of the pressure regulator. Accordingly, the space for locating the pressure regulator in the lower case and (or) the upper case becomes narrow in a direction intersecting with the inserting direction of the pressure regulator.

[0023] Furthermore, the fuel pump module according to the present invention comprises a cover-equipping case provided by forming integrally the upper case and a conjunction cover, the conjunction cover linking one ends of a fuel pump and a strain which are held by the upper cover, to each other; and a pump bottom cover for fixing the other end of the fuel pump to the cover-equipping case, wherein both of the fuel pump and the strainer are linked to a communication passage provide in the conjunction cover by pushing both of the fuel pump and the strainer into the conjunction cover.

[0024] According to the present invention, the cover-equipping case is provided by integrally forming the upper case and the conjunction cover. Accordingly, by pushing the fuel pump and the strainer into the cover-equipping case, the fuel pump and the strainer are automatically linked to the communication passage of the conjunction cover.

[0025] Also, the fuel pump module according to the present invention is one that the fuel pump has a pump housing, a pump driving portion to be driven in the pump housing, and at least one terminal provided in the pump housing so as to project therefrom and supplying the pump driving portion with a power source; the conjunction cover includes a cover body, a coupler housing formed integrally with the cover body, and a terminal hole which is formed in the coupler housing and which the terminal is inserted into; and a coupler to be electrically connected to a counterpart coupler is formed by linking both of the fuel pump and the strainer to the conjunction cover and by inserting the terminal into the terminal hole. According to the present invention, the pump housing of the fuel pump has at least one terminal projected therefrom. The coupler housing is integrally formed with the cover body of the conjunction cover. By linking both of the fuel pump and the strainer to the conjunction cover, the fuel pump and the strainer are linked to each other via the communication passage, and the terminal of the pump housing is inserted into the coupler housing of the conjunction cover. That is, the coupler to be electrically connected to the counterpart couple is constituted by two parts comprising the conjunction cover and the pump housing.

[0026] Another fuel pump module according to the present invention, having a lower case, an upper case to be capped on the lower case, a fuel pump and a fuel-purifying strainer which are held in the lower case, and a conjunction cover for holding both of the fuel pump and the strainer in the upper case and connecting the both to each other, in which the fuel pump is driven by electrically connecting the fuel pump to a counterpart coupler, comprises the fuel pump having a pump housing and a pump driving portion to be driven in the pump housing; at least one terminal provided on the pump housing so as to project therefrom and supplying the pump driving portion with a power source; a coupler housing formed integrally with the conjunction cover; and a terminal hole which is formed in the coupler housing and which the terminal is inserted into, wherein a coupler to be connected to the counterpart coupler is formed by linking both of the fuel pump and the strainer to the conjunction cover and by inserting the terminal into the terminal hole. According to the present invention, the pump housing of the fuel pump has at least one terminal projected therefrom. The coupler housing is integrally formed with the cover body of the conjunction cover. By linking the fuel pump and the strainer to the conjunction cover, the fuel pump and the strainer are linked to each other, and the terminal of the pump hous-

ing is inserted into the coupler housing of the conjunction cover. That is, the coupler to be electrically connected to the counterpart couple is constituted by two parts comprising the conjunction cover and the pump housing.

[0027] Furthermore, another fuel pump module according to the present invention is one that the coupler housing has another engagement portion to be engaged with an engagement portion provided in the counterpart coupler. Accordingly, since the coupler housing has the another engagement portion to be engaged with the engagement portion of the counterpart coupler, the another engagement portion and the engagement portion are automatically engaged with each other by inserting the counterpart coupler into the coupler housing,.

[0028] Furthermore, another fuel pump module according to the present invention further comprises a hook-like wire holding portion formed integrally with an outer surface of the conjunction cover. As a result of this, since the hook-like wire holding portion is integrally formed with the outer surface of the conjunction cover, the bundle of wire does not come apart and remains being a bundle.

[0029] Furthermore, another fuel pump module according to the present invention is one that the strainer has a purifying portion for purifying the fuel and a strainer cover for covering an outer surface of the purifying portion; and the strainer cover is made of a metal. As a result of this, since the strainer has the purifying portion and the metallic strainer cover that covers the outer surface of the purifying portion, the strainer can be rigidly held and fixed to the lower case.

[0030] Another fuel pump module according to the present invention, having a lower case, an upper case to be capped on the lower case, a fuel pump located in the lower case, a strainer for purifying fuel, and a pressure regulator for regulating pressure of the fuel, comprises the strainer having a purifying portion for purifying the fuel, and a strainer cover made of the same material as the lower case and covering an outer surface of the purifying portion; and the strainer cover divided in two such that a first cover which is one is formed integrally with the lower case and a second cover which is the other is separated from the lower case, wherein the second cover is welded to the first cover after insertion of the purifying portion into the first cover, and at least one of the fuel pump and the pressure regulator is held in the upper case. According to the present invention, the strainer cover of the strainer is formed of the same material as the lower case, and the strainer cover is divided into both of the first cover formed integrally with the lower case and the second cover separated from the lower case. After insertion of the purifying portion into the first case, the first and second covers are welded to each other. Consequently, the strainer is stabilized in the lower case.

[0031] Yet another fuel pump module according to the present invention, having a lower case, an upper case to be capped on the lower case, a fuel pump located in the lower case, a strainer for purifying fuel, and a pressure regulator for regulating pressure of the fuel, comprises the strainer having a purifying portion for purifying the fuel, and a strainer cover covering an outer surface of the purifying portion; the strainer cover divided in two such that a first cover which is one is formed integrally with the lower case and a second cover which is the other is separated from the lower case; an engagement portion formed in an end of the second cover facing the first cover; and another engagement portion formed in an end portion of the first cover facing the second cover, wherein the engagement portion is engaged with the another engagement portion via a sealing member after insertion of the purifying portion into the first cover, and at least one of the fuel pump and the pressure regulator is held in the upper case. According to the present invention, the strainer cover of the strainer is formed of the same material as the lower case, and the strainer cover is divided into both of the first cover formed integrally with the lower case and the second cover separated from the lower case. The engagement portion is provided in the end portion of the second cover facing the first cover, and the another engagement portion is formed in the end portion of the first cover facing the second cover. By engaging the engagement and another engagement portions with each other, the first and second covers are connected to each other via the sealing ember. That is, the first and second covers are fixed by one-touch operation.

[0032] Furthermore, yet another fuel pump module according to the present invention is one that integral formation of the upper case with the second case prevents at least one of the fuel pump and the pressure regulator from being disconnected from the lower case. According to the present invention, the upper cover holding the pressure regulator and the fuel pump is formed integrally with the second cover. Accordingly, when the second cover is assembled to the first cover, the upper case is automatically capped on the lower case. As a result of this, it is possible to prevent at least one of the fuel pump and the pressure regulator from being disconnected from the lower case.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

FIG. 1 is a cross section showing a first embodiment of the fuel pump module according to the present invention.

FIG. 2 is a front view of the lower case shown in FIG. 1.

FIG. 3 is a view seen from a direction of arrow X of FIG. 1.

FIG. 4 is a view showing the state that the conjunction cover is capped on the upper cover of FIG. 3.

FIG. 5 is a cross section taking along line Y-Y of

FIG. 4.
FIG. 6 is a side view showing the state that the fuel pump module of FIG. 4 is mounted in a fuel tank.
FIG. 7 is an explanatory view showing flow of the fuel accommodated in the fuel pump module of FIG. 6.
FIG. 8 is an exploded perspective view showing a second embodiment of the fuel pump module according to the present invention.
FIG. 9 is an exploded view showing a fuel pump module that is a third embodiment of the present invention.
FIG. 10 is an essentially cross section of FIG. 9.
FIG. 11 is a plane view showing the conjunction cover of FIG. 9.
FIG. 12 is an essentially cross section showing the state that a coupler and a counterpart coupler are connected to each other in FIG. 10.
FIG. 13 is a view showing an assembly-completing state of FIG. 9 and seeing the state from above.
FIG. 14 is an essentially cross section showing a fourth embodiment of the fuel pump module according to the present invention.
FIG. 15 is an essentially cross section showing a fifth embodiment of the fuel pump module according to the present invention.
FIG. 16 is an enlarged sectional view showing an engagement means of FIG. 15.
FIG. 17 is an essentially cross section showing a sixth embodiment of the fuel pump module according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] In the following, embodiments of the present invention will be explained with reference to the drawings.

(First embodiment)

[0035] FIGs. 1 to 7 show a first embodiment of the fuel pump module according to the present invention.

[0036] As shown in FIG. 1, this fuel pump module 1 comprises an installing portion 3 of a lower case 2, a pressing portion 5 of an upper case 4, an auxiliary passage 7 provided between a fuel passage 6 and the installing portion 3, and a pressure regulator 8 sandwiched by the installing portion 3 and the pressing portion 5.

[0037] As shown in FIGs. 1 and 2, the lower case 2 is made of a synthetic resin, and consists of a bottom wall 11, a peripheral wall 12 integrally provided around the periphery of the bottom wall 11, and the fuel passage 6 crossing the bottom wall 11 at right angles. The lower case 2 serves as a reservoir 13 for reserving the fuel. It is also possible to separately form another reservoir (not shown) for reserving the fuel in the lower case 2, instead of serving the lower case 2 as the reservoir 13.

[0038] The bottom wall 11 is provided with the fuel passage 6 perpendicularly traversing therein. One end of the fuel passage 6 is connected to a strainer installing portion 14. The other end of the fuel passage 6 is projected to the outside from the bottom wall 11 to form an outlet 15 guiding the fuel to an engine (not shown). Then, on the bottom wall 11, the installing portion 3, the strainer installing portion 14 and a thermistor installing portion (not shown) are integrally provided, respectively. The pressure regulator 8, a strainer 9, and a thermistor 10 are mounted in the installing portion 3, the strainer installing portion 14 and the thermistor installing portion, respectively. Incidentally, the reference numeral 27 denotes an O-ring.

[0039] The auxiliary passage 7 is provided between the fuel passage 6 and the installing portion 3. Accordingly, by merely mounting the pressure regulator 8 in the installing portion 3, it is possible to automatically connect the pressure regulator 8 to both of the fuel passage 6 and the strainer 9 via the auxiliary passage 7. While the auxiliary passage 7 is located at approximately right angles with respect to the fuel passage 6 in the present embodiment, the location thereof is not limited to this approximately right-angled.

[0040] As shown in FIGs. 1 and 3, the upper case 4 is made of a synthetic resin, and capped on an upper part of the reservoir 13. The upper case 4 has an upper wall 21, a peripheral wall 22 which is downwardly formed around the periphery of the upper wall 21, and the pressing portion 5 projected from the inner surface of the upper wall 21. In the upper wall 21, a pump hole 23, a strainer hole 24, a thermistor hole 25, and a regulator hole 29 are provided, respectively. A protecting tube 26 (see FIG. 8) is downwardly formed continuously and integrally formed to extend downwardly from the periphery of the pump hole 23. The pump hole 23, the strainer hole 24 and the thermistor hole 25 hold the fuel pump 19, a strainer 9, and the thermistor 10, respectively. The thermistor 10 is used as a remaining fuel alarming sensor in the reservoir 13.

[0041] As shown in FIG. 1, the pressure regulator 8 is intended for controlling pressure of fuel flowing through the fuel passage 6. More specifically, the pressure regulator 8 has a cylinder-shaped main body 31, a first inserting portion 32 provided on one end (a lower end) of the main body 31, and a second inserting portion 33 continuously formed on the other end (an upper end) of the main body 31. The outer surface of the main body 31 has a collar 34 provided around the other end side thereof. The first inserting portion 32 and the second inserting portion 33 are inserted (installed) in the installing portion 3 of the reservoir 13 and the pressing portion 5 of the upper case 4, respectively. Incidentally, the reference numeral 28 denotes an O-ring.

[0042] Then, the pressure regulator 8 is sandwiched and fixed between the installing portion 3 and the pressing portion 5 so that the collar 34 is pressed downwardly

by the pressing portion 5. As a result of this, it is possible to securely hold the pressure regulator 8 in an up and down direction (vertical direction).

[0043] After sandwiching and fixing the pressure regulator 8, a return passage 35 of the main body 31 is disposed in the reservoir 13. Accordingly, the fuel pressure of the fuel flowing through the fuel passage 6 and a fuel pipe 18 is regulated by the pressure regulator 8. That is, excess fuel is returned to the interior of the reservoir 13 as described above. As a result of this, the fuel in the reservoir 13 can be used to avoid waste, and stable supply of the fuel can thereby be realized.

[0044] Furthermore, a standing position of the pressure regulator 8 sandwiched and fixed is approximately parallel with an inserting direction (a P direction) of the pressure regulator 8 into the installing portion 3. That is, an axial direction of the main body 31 (corresponding to a longitudinal direction in claims) is approximately parallel with the inserting direction (P direction) of the pressure regulator 8 into the installing portion 3.

[0045] As shown in FIGs. 4 and 5, after locating the fuel pomp 19 and the strainer 9 in the lower case 2, a conjunction cover 41 is capped on respective upper portions of the fuel pump 19 and the strainer 9. Connection between the fuel pump 19 and the conjunction cover 41 may be achieved by fitting a projection portion provided on one of the fuel pump 19 and the conjunction cover 41, to a recess portion formed in the other of the fuel pump 19 and the conjunction cover 41. Also, connection between the strainer 9 and the conjunction cover 41 is accomplished in almost the same manner. Means for connecting both of the fuel pump 19 and the strainer 9 to the conjunction cover 41 is not limited to those as described above.

[0046] In the conjunction cover 41 is formed a communication passage 42. The communication passage 42 has a straight passage 43 formed along a longitudinal direction of the conjunction cover 41, both of a pump passage 44 and a strainer passage 45 roughly intersecting at right angles in the middle of the straight passage 43, and a check valve 46 provided in one end of the straight passage 43. The other end of the straight passage 43 has a closed end. To the pump passage 44 and the strainer passage 45, the fuel pump 19 and the strainer 9 are mounted, respectively. Consequently, the fuel pump 19 and the strainer 9 are connected to each other via the communication passage 42. Furthermore, when the engine is stopped and compression transport of the fuel from the fuel pump 19 is stopped, the check valve 46 rapidly closes to keep the constant pressure between the fuel pump and the engine. Incidentally, each of the reference numerals 47, 48 and 49 denotes an O-ring.

[0047] As shown in FIG. 6, the fuel pump module 1 being the in-tank type and being mounted in a fuel tank 50 of a vehicle or the like serves as a kind of sub tank for the fuel tank 50. To be more specific, the sub tank temporarily reserves the fuel in the fuel tank 50 so that the fuel is smoothly supplied to the engine from the fuel tank 50 via the fuel pump module 1 even when the vehicle or the like runs a hill or (and) the vehicle or the like shakes.

[0048] Next, flow of the fuel supplied from the fuel tank 50 to the engine via the fuel pump module 1 will be explained.

[0049] As shown in FIGs. 6 and 7, when the fuel pump module 1 is mounted in the fuel tank 50 of a vehicle or the like, the fuel flows into the reservoir 13 of the fuel pump module 1 via a fuel inlet 17 provided in the lower case 2. The fuel supplied in the reservoir 13 is sucked into the fuel pump 19 via a pump filter 20 (see FIG. 8) to flow into the strainer 9 thorough the communication passage 42. Since the auxiliary passage 7 is connected to the fuel passage 6, the fuel from the strainer 9 is branched at the middle portion of the fuel passage 6 to flow to the outlet 15, and to flow to the pressure regulator 8 from the auxiliary passage 7.

[0050] The fuel which travels straight from the strainer 9 through the fuel passage 6 flows to the outlet 15 provided integrally with the outer surface of the lower case 2. Since a fuel pipe 18 which leads to the engine is connected to the outlet 15, the fuel from the strainer 9 is supplied to the engine from the outlet 15 via the fuel piping 18.

[0051] The fuel flowing to a side of the auxiliary passage 7 from the strainer 9 flows into the pressure regulator 8. Since the pressure of the fuel in both the fuel passage 6 and the fuel pipe 18 is regulated by the pressure regulator 8, the fuel pressure is kept approximately constant. Therefore, in the case where an amount of compression transport fuel from the fuel pump is more than that of jet fuel jetted at the engine, for example, since the fuel pressure of the fuel flowing through the fuel passage 6 and the fuel pipe 18 increases, the fuel is discharged as excess fuel. Then, the excess fuel is returned to the reservoir 13 from the pressure regulator 8, whereby the fuel pressure of the respective interiors of the fuel pipe 18 and the fuel passage 6 is kept constant.

[0052] Next, a method for mounting the pressure regulator 8 will be explained.

[0053] As shown in FIG. 1, the first inserting portion 32 of the pressure regulator 8 is inserted (mounted) into the installing portion 3 of the lower case 2 and temporarily secured thereto. As shown in FIG. 1, the upper case 4 is capped on the lower case 2 in such a state as to make the pressing portion 5 of the upper case 4 faces the second inserting portion 33 of the pressure regulator 8. After capping, the second inserting portion 33 is pressed into the pressing portion 5. At the same time, the pressing portion 5 presses the collar 34 of the pressure regulator 8 downwardly. That is, the pressure regulator 8 is pressed downwardly from the pressing portion 5 via the collar 34. Consequently, even if vibrations and the like are transmitted to the fuel pump module 1 during the running of a vehicle or the like, it is possible to minimize a vertical vibration and (or) a horizontal vi-

bration transmitted to the pressure regulator 8. As a result of this, the fixing structure of the pressure regulator 8 is strengthened in vibration in comparison with the conventional structures.

[0054] The pressure regulator 8 sandwiched and fixed between the upper case 4 and the lower case 2 is held in the up and down direction (upright condition). Under this condition, since the installing portion 3 of the lower case 2 does not strike the collar 34, the return passage 35 of the pressure regulator 8 is exposed between the collar 34 and the installing portion 3. Furthermore, since the auxiliary passage 7 is provided between the installing portion 3 and the fuel passage 6, the pressure regulator 8 is automatically connected to the fuel passage 6 after being sandwiched and fixed. Accordingly, the installing portion 3 can have a function of holding the pressure regulator 8 and a function of connecting the pressure regulator 8 to the fuel passage 6. As a result of this, it is possible to reduce the number of parts constituting the fuel pump module 1 and to achieve miniaturization of the fuel pump module 1 in comparison with the conventional pump modules.

(Second embodiment)

[0055] FIG. 8 is a view showing a second embodiment of a fuel pump module 1' according to the present invention. The same members as the first embodiment are denoted by the same reference numerals and explanation thereof will be omitted.

[0056] This fuel pump module 1' comprises a cover-equipping case 53 integrally formed by molding the upper case 4 and the conjunction cover 41 to be assembled thereto, and a pump bottom cover 54 for fixing the fuel pump 19 to the cover-equipping case 53.

[0057] As shown in FIGs. 3 and 8, the upper case 4 holds the fuel pump 19, the strainer 9, the pressure regulator 8, and the thermistor 10. The conjunction cover 41 is integrally formed so as to cover the respective one ends of the fuel pump 19 and the strainer 9. In the upper wall 21 of the upper case 4, the pump hole 23, the strainer hole 24, the regulator hole 29, and the thermistor hole 25 (see FIG. 3) are formed, respectively. On the other end of the protecting tube 26 is provided an engagement portion 26a for engaging the pump bottom cover 54 therewith.

[0058] On the other hand, the pump bottom cover 54 has a roughly disk-shaped cover body 55. The cover body 55 has a long hole 55a formed at the center thereof, and another engagement portion 55b integrally provided at a periphery thereof and engaged with the engagement portion 26a. To the other end of the fuel pump 19, the pump filter 20 is detachably attached via the pump bottom cover 54. The long hole 55a may be a notch.

[0059] Next, a method for assembling the fuel pump 19 to the cover-equipping case 53 will be explained.

[0060] One end portion of the fuel pump 19 is inserted into the pump hole 23 from the other end portion of the protecting cover 26, and an outlet 19a of the fuel pump 19 is pushed into the pump passage 44 of the conjunction cover 41. At this time, by merely inserting the fuel pump 19 into the cover-equipping case 53, it is possible to automatically connect the outlet 19a and the pump passage 44 to each other without positioning the fuel pump 19 (outlet 19a) with respect to the conjunction cover 41 (pump passage 44) (see FIG. 5).

[0061] Then, the pump bottom cover 54 is inserted into the other end of the protecting tube 26. By engaging the engagement portion 26a of the protecting tube 26 with the another engagement portion 55b of the pump bottom cover 54, it is possible to easily fix the fuel pump 19 to the cover-equipping case 53 without positioning the conjunction cover 41 with respect to the upper case 4. On the other end portion of the fuel pump 19, the pump filter 20 is detachably provided via the long hole 55a of the pump bottom cover 54. On the other hand, in the case where the pump bottom cover 54 is provided with a notch instead of the long hole 55a, the fuel pump module 1' has more excellent resistance to vibrations without requiring to detachably provide the pump filter 20.

[0062] In almost the same manner, as to the strainer 9, by merely pushing the strainer 9 into the strainer hole 24 of the cover-equipping case 53, it is possible to securely connect the strainer passage 45 and an inlet 9a to each other, without positioning the inlet 9a of the strainer 9 with respect to the strainer passage 45 (See FIG. 5).

[0063] In this way, by integrally forming the upper case 4 and the conjunction cover 41 to provide the cover-equipping case 53, it is possible to omit accurate positioning operations during assembling operation, and thereby to improve the assembling operability of the fuel pump module 1'. Furthermore, since the pump bottom cover 54 has a simple shape, a molding die used in molding it can be simplified in shape. Therefore, production of the fuel pump module 1' can be achieved with low costs. Furthermore, since the upper case 4 and the conjunction cover 41 are integrally formed, a more reliable structure of the fuel pump module 1', in which respective connections between the fuel pump 19 and the communication passage 42 and between the strainer 9 and the communication passage 42 are not released due to vibrations of a vehicle or the like, can be provided.

(Third embodiment)

[0064] FIGs. 9 to 13 show a third embodiment of the fuel pump module according to the present invention. FIG. 9 is an exploded view of the fuel pump module that is the third embodiment of the present invention, and FIG. 10 is an essentially cross section of FIG. 9. FIG. 11 is a plane view showing the conjunction cover of FIG. 9, and FIG. 12 is an essentially cross section showing the state that a counterpart coupler and a coupler of FIG.

10 are connected to each other. FIG. 13 is a view showing an assembling-completing state of FIG. 9 and seeing the state from above. The same constituting members as the first and second embodiments are denoted by the same reference numerals, and explanation thereof will be omitted.

[0065] As shown in FIG. 9, a fuel pump module 1A of the third embodiment 3 has such a structure that a coupler 61 to be connected to a counterpart coupler 60 is formed by coupling the conjunction cover 41 to the fuel pump 19, in order to drive the fuel pump 19.

[0066] To be more specific, this fuel pump module 1A comprises two terminals 63 (one of the terminals is shown and the other is omitted in the drawings) provided in a pump housing 62 of the fuel pump 19, a coupler housing 64 integrally formed in the conjunction cover 41, a counterpart-coupler insertion hole 65 formed in the coupler housing 64 (corresponding to a terminal hole in claims). The counterpart-coupler insertion hole 65 allows insertion of not only the terminals 63 but also of the counterpart coupler 60. Incidentally, the number of terminal is optional. Further, if the coupler housing 64 has a wall (not shown) at a side of the fuel pump 19, it is also possible to provide a hole (not shown) allowing insertion of only the terminals 63. Furthermore, although the terminals 63 are of the tab-shaped male type in the present embodiment, the terminals 63 may be of the female type.

[0067] As shown in FIGs. 9 and 10, the fuel pump 19 comprises the cylindrical pump housing 62, a pump driving portion not shown which is provided in the pump housing 62 and is driven, and the terminals 63 provided so as to project from an upper portion of the pump housing 62. The pump housing 62 is made of a synthetic resin. In the upper portion of the pump housing 62 is provided terminal insertion holes 62a through which the terminals 63 project from the inside of the pump housing 62 to the outside. One end side of each of the terminals 63 (an inside of the pump housing 62) is electrically connected to the pump driving portion. The other end side 63a (an outside of the pump housing 62) is electrically connected to the counterpart coupler 60.

[0068] As shown in FIGs. 9 and 11, the conjunction cover 41 has a conjunction cover body 66 holding the fuel pump 19 and the strainer 9 and connecting the fuel pump 19 and the strainer 9 to each other, and the coupler housing 64 integrally formed at the conjunction cover body 66 and located at a side of the fuel pump 19. The coupler housing 64 comprises the counterpart-coupler insertion hole 65 having such a size as to allow insertion of the counterpart coupler 60 and passing through the conjunction cover body 66 in an up and down direction, and a projection-shaped engagement portion 67a provided on the outside of a peripheral wall 67 of the conjunction cover body 66. When the fuel pump 19 is attached to the conjunction cover 41, the terminals 63 of the pump housing 62 are arranged in the upright condition from the counterpart-coupler insertion hole 65. That is, only the terminals 63 are provided in the pump housing 62 in a standing manner so as to correspond to the counterpart coupler 60 and only the coupler housing 64 is formed integrally with the conjunction cover 41, and thereafter the coupler 61 to be connected to the counterpart coupler 60 is formed by coupling of the fuel pump 19 and the conjunction cover 41.

[0069] As shown in FIG. 10, the counterpart coupler 60 comprises a coupler housing 60a, two wire-connected terminals 60c (one of the wire-connected terminals is shown and the other is omitted in the drawings) inserted into and secured to a terminal accommodating chamber 60b in the coupler housing 60a, a lock arm 60d raised on an upper part of the coupler housing 60a, an operational panel 60e formed integrally with the lock arm 60d, and another hole-shaped engagement portion 60f formed at the operational panel 60e. Each of the wire-connected terminals 60c has a terminal plate 60g of a branch-shaped female type, and a bundle of wire 68 crimped on one end portion of the terminal plate 60g. In the terminal-accommodating chamber 60b, an engagement arm 60h formed continuously with the coupler housing 60a is located, and the terminal plate 60g is secured to be pressed from the backward thereof to the frontward by the engagement arm 60h. Although the terminal plate 60g is of a female type in the present embodiment, it may be of a male type.

[0070] As shown in FIGs. 10 and 12, when the counterpart coupler 60 is inserted into the coupler 61, the operational panel 60e is brought up by the another engagement portion 60f, so that the engagement portion 67a and the another engagement portion 60f are engaged with each other. At the same time, the terminals 63 in the coupler 61 and the wire-connected terminals 60c in the counterpart coupler 60 are electrically connected with one another.

[0071] By employing the above structure, as the fuel pump module 1A becomes small, the coupler 61 and the counterpart coupler 60 become also small, respectively. However, if just the terminals 63 are provided in the pump housing 62 and just the coupler housing 64 is integrally formed with the conjunction cover 41, then coupler size securely capable of corresponding to miniaturization of the fuel pump module 1A can achieved.

[0072] The reason is as follows. Since only the terminals 63 are provided in the pump module 62, a pump layout depending on the size of the fuel pump 19 is difficult to be restricted by, in comparison with the conventional pump modules. At the same time, since only the coupler housing 64 is integrally formed with the conjunction cover 41, it is possible to save time and labor for forming the coupler 61 having such a size as to correspond to miniaturization of the fuel pump module 1A by another method, in comparison with the conventional pump modules . Furthermore, since the coupler 61 to be connected to the counterpart coupler 60 can be easily provided by merely attaching the fuel pomp 62 to the conjunction cover 41, the trouble of forming both the

small terminals 63 and the coupler housing 64 that correspond to the miniaturized fuel pump module 1A and of fitting the small terminals 63 to the coupler housing 64 to electrically connect one of the small terminals to the other, is eliminated, in comparison with the conventional pump modules.

[0073] Furthermore, in the present embodiment, as shown in FIGs. 11 and 13, a hook-like wire holding portion 69 for holding the bundle of wire 68 is formed integrally with the cover body 66 of the conjunction cover 41. The shape of the wire holding portion 69 is not limited to the hook-like shape, and the conjunction cover 41 used in the other embodiments may also be provided with the wire holding portion 69. By providing such wire holding portion 69, it is possible to prevent the bundle of wire 68 from coming apart after assembly of the fuel pump module 1A. Thus, since the wire holding portion 69 is formed integrally with the conjunction cover 41, it becomes unnecessary to use another member for holding the bundle of wire 68, and hence it is possible to reduce the number of parts constituting the fuel pump module 1A.

(Fourth embodiment)

[0074] FIG. 14 is a view showing a fourth embodiment of the fuel pump module according to the present invention, and is an essentially cross section of the fuel pump module. The same constituting members as the first, second and third embodiments are denoted by the same reference numerals, and explanations thereof will be omitted.

[0075] As shown in FIG. 14, a fuel pump module 1B in the fourth embodiment comprises the lower case 2, an upper case 70 to be capped on the lower case 2, and a fuel pump (not shown in FIG. 14) and a strainer 71 and the pressure regulator 8 that are held in the upper case 70. While the upper case 4 of the first embodiment (see FIG. 1) has the fuel pump 19, the strainer 9 and the pressure regulator 8, the upper case 70 of the fourth embodiment holds the pressure regulator 8. It is also possible to hold the fuel pump 19 together with the pressure regulator 8 in the upper case 70.

[0076] The strainer 71 has a purifying portion 72 for purifying the fuel, a strainer cover 73 made of the same material as the lower case 2 and covering an outer surface of the purifying portion 72. The strainer cover 73 is divided into an upper strainer cover 74 (corresponding to the second cover in claims) and a lower strainer cover 75 (corresponding to the first cover in claims). The lower strainer cover 75 is made of the same material as the lower case 2, i.e. synthetic resin, and formed integrally with the lower case 2. The upper strainer cover 74 is made of the same material as the lower case 2, i.e. synthetic resin, but is formed separately from the lower strainer cover 75, i.e. the lower case 2.

[0077] After the purifying portion 72 is inserted into the lower strainer cover 75, the upper strainer cover 74 is covered on the lower strainer cover 75, and a lower end portion 74a (corresponding to the end portion in claims) of the upper strainer cover 74 and an upper end portion 75a (corresponding to the end portion in claims) of the lower strainer cover 75 are coupled to each other, for example, by welding. Then the upper case 70 is assembled to the lower case 2 while holding the pressure regulator 8. In an upper wall 70' of the upper case 70, are formed the regulator hole 29 and the pump hole (not shown), similarly to the first embodiment, and the pressure regulator 8 and the fuel pump are held in the respective holes 29.

[0078] The upper strainer cover 74 is provided with an inlet 76 for supplying the fuel from the fuel pump, and the inlet 76 and the fuel pump is linked to each other by a fuel pipe (not shown). At the lower strainer cover 75 is formed an outlet 80 for discharging the fuel purified by the purifying portion 72. Accordingly, the fuel accommodated in the fuel tank is pumped by the fuel pump, supplied from the inlet 76 via the fuel pipe by the fuel pump, and supplied to the auxiliary passage 7 from the outlet 80 via the purifying portion 72.

[0079] Since the lower strainer cover 75 is integrally formed with the lower case 2, it is possible to hold stably the purifying portion 72 of the strainer 71 in the lower strainer cover 75, for example, in comparison with the case where the strainer 9 is held in the lower case 2 similarly to the first embodiment (see FIG. 1). Furthermore, since, with the purifying portion 72 being held in the lower strainer cover 75, the upper strainer cover 74 is welded to the lower strainer cover 75, it is possible to hold more stably the strainer 71 after welding, and thereby to improve the holding power of holding the strainer 71. Therefore, it is possible to synchronize the stable condition of the strainer 71 with that of the lower case 2. That is, when the fuel pump module 1B is installed to a vehicle or the like, if just the lower case 2 of the fuel pump module 1B is mounted to the fuel tank so as to become stable, it is possible to stabilize condition of the strainer 71 as corresponding to the stable condition of the lower case 2.

(Fifth embodiment)

[0080] FIGs. 15 and 16 show a fifth embodiment of the fuel pump module according to the present invention. FIG. 15 is an essentially cross section of the fuel pump module and FIG. 16 is an enlarged cross section of the engagement means in FIG. 15. The same constituting members as the first to fourth embodiments are denoted by the same reference numerals, and explanations thereof will be omitted.

[0081] As shown in FIG. 15, a fuel pump module 1C of the fifth embodiment has such a structure that the lower strainer cover 75 formed integrally with the lower case 2, and the upper strainer cover 74 are engaged by an engagement means 77. And, between the upper strainer cover 74 and the lower strainer cover 75 is interposed

a sealing member 78 such as an O-ring.

[0082] As shown in FIGs. 15 and 16, the engagement means 77 is a means such that an engagement portion 75b is formed on the upper end portion 75a of the lower strainer cover 75, and another engagement portion 74b to be engaged with the engagement portion 75b is provided on the lower end portion 74a of the upper strainer cover 74. For instance, a means may be used such that an engaging groove is formed on the upper end portion 75a of the lower strainer cover 75, and an engaging projection to be fitted into the engaging groove is provided on the lower end portion 74a of the upper strainer cover 74. Alternatively, another means may be used such that an engaging hook is provided on the upper end portion 75a of the lower strainer cover 75, and another engaging hook to be fitted to the engaging hook is formed on the lower end portion 74a of the upper strainer cover 74. Incidentally, the engagement means 77 is not limited to the above-mentioned examples, but can be arbitrarily changed so far as the upper strainer cover 74 and the lower strainer cover 75 can be coupled to each other.

[0083] With such a structure, since the upper strainer cover 74 and the lower strainer cover 75 can be connected by one-touch operation, it is possible to improve assemble operability in comparison with the fourth embodiment using welding.

(Sixth embodiment)

[0084] FIG. 17 shows a sixth embodiment of the fuel pump module according to the present invention, and is an essentially cross section of the fuel pump. The same constituting members as the first to fifth embodiments are denoted by the same reference numerals, and explanations thereof will be omitted.

[0085] As shown in FIG. 17, a fuel pump module 1D of the sixth embodiment has such a structure that an upper case module 81 is provided by integrally forming the upper case 70 and the upper strainer cover 74 of the fourth and fifth embodiments, and the upper case module 81 is welded to the lower strainer cover 75. The upper case module 81 is made of a synthetic resin similarly to the lower strainer cover 75.

[0086] Since the upper case module 81 is welded to the lower strainer cover 75 after inserting the purifying portion 72 into the lower strainer cover 75, this embodiment is similar to the fourth and fifth embodiments relative to the stability of the strainer 71. Additionally, according to the sixth embodiment, it is possible to hold also the pressure regulator 8 in the lower strainer cover 75 in the same stable condition as the strainer 71 after welding the upper case module 81 to the lower strainer cover 75. That is, it is possible to improve the holding force of holding the strainer cover 75 and the pressure regulator 8. Incidentally, it is also possible to hold the fuel pump 19 together with the pressure regulator 8 in the upper case module 81. For this reason, since a welding portion between the upper case module 81 and the lower strainer cover 75 can bear disconnecting load necessary for disconnecting the pressure regulator 8 from the upper case module 81, disconnecting of the pressure regulator 8 is securely prevented. As a result of this, the holding power of holding the pressure regulator 8 into the upper case module 81 can be improved. That is, since the holding power of the pressure regulator 8 is improved, the reliability about strength of the fuel pump module 1D is also improved as corresponding to the holding power.

[0087] It goes without saying that the present invention is not limited to the above-mentioned embodiments, but can be modified in various manners without departing from the gist of the present invention.

[0088] For example, it is possible to arbitrarily change the material of the upper cases 4, 70 and the lower case 2. The fuel pump 19 and the pressure regulator 8 can have the same constitution as the strainer 71 described in the fourth to the sixth embodiments of the present invention. That is, such a structure may be used that the fuel pump 19 is constituted by the pump housing 62 and the pump driving portion (not shown) in the pump housing 62, and the pump housing 62 is divided in two to form integrally one of the divided pump housing with the lower case 2 and to connect the one and the other to each other after the pump driving portion is inserted into the one.

[0089] Similarly, such a structure may be used that the pressure regulator 8 is constituted by a regulator housing (not shown) and a regulator body (not shown) in the regulator housing, and the regulator housing is divided in two to form integrally one of the divided regulator housing with the lower case and to connect the one and the other to each other after the regulator body is inserted into the one.

[0090] Furthermore, the third embodiment has a terminal connecting hole (not shown) provided in the pump housing 62, and the counterpart coupler 60 of a male type. Then, the counterpart coupler 60 is inserted into the terminal connecting hole, and the male-type terminals of the counterpart coupler 60 are electrically and directly connected to the pump driving portion, and thereby the counterpart coupler 60 is electrically connected to the fuel pump 19.

[0091] Although the strainer cover is divided in two in the present embodiment, the dividing number thereof is not limited to this.

[0092] According to the present invention, since the lower case is provided with the installing portion and the upper case is provided with the pressing portion projected therefrom, the pressure regulator can be sandwiched and fixed between the installing portion and the pressing portion by capping the upper case on the lower case. Therefore, it is possible to reduce the number of parts constituting the fuel pump module in comparison with the conventional pump modules. Furthermore, by capping the upper case on the lower case after inserting the pressure regulator into the installing portion, the pres-

sure regulator can easily and securely be fixed by the upper case and the lower case. In addition, since the pressure regulator is pressed to a side of the lower case by the upper case, it is possible to improve the holding power of the pressure regulator into both cases. Accordingly, it is possible to securely hold the pressure regulator so as to resist even vibrations and the like caused by driving a vehicle.

[0093] Further, by providing the auxiliary passage between the installing portion and the fuel passage and between the installing portion and the strainer, it is possible to use the installing portion also as a passage for the fuel. Then, by mounting the pressure regulator to the installing portion, it is possible to connect the pressure regulator to the fuel passage automatically. Accordingly, it is possible to reduce the number of parts constituting the fuel pump module in comparison with the conventional pump modules.

[0094] Furthermore, since the longitudinal direction of the pressure regulator is set to be approximately parallel to the inserting direction of the pressure regulator into the installing portion, it is possible to save the arrangement space for arranging the pressure regulator in the lower case. Accordingly, it is possible to minimize the arrangement space of the pressure regulator in a direction crossing the inserting direction. As a result of this, minimizing the fuel pump module can be achieved in comparison with the conventional pump modules.

[0095] Moreover, by providing the return passage of the pressure regulator in the lower case after coupling the upper case to the lower case, the return fuel from the pressure regulator is returned to the reservoir. Accordingly, the fuel in the reservoir is not easily discharged outside the reservoir because the reservoir is provided in the fuel pump module. That is, the fuel accommodated in the reservoir can be used to avoid waste and hence stable supply of the fuel to the engine can be achieved.

[0096] Furthermore, since the conjunction cover and the upper case are integrally formed, it is possible to omit both positioning and coupling operations of the conjunction cover with respect to the upper case. Further, by merely pushing the fuel pump and the strainer into the conjunction cover, it is possible to connect both of the fuel pump and the strainer to the communication passage of the conjunction cover automatically. Therefore, it is possible to eliminate the positioning operation between the fuel pump and the strainer with respect to the communication passage. Furthermore, since the fuel pump is fixed by the pump bottom cover, the fixing operation of the fuel pump is easily performed. Moreover, since the conjunction cover and the upper case are integrally formed, both of the fuel pump and the strainer is not easily to be disconnected from the communication passage due to vibrations caused by driving a vehicle or the like. As a result of this, the fuel pump module provided by the present invention can have a more reliable structure.

[0097] According to another invention, by providing the pump housing constituting the fuel pump with the terminal, forming integrally the coupler housing with the conjunction cover, and assembling the fuel pump to the conjunction cover, it is possible to constitute the coupler to be connected to the counterpart coupler. Therefore, it is unnecessary to form a coupler at the fuel pump in comparison with the conventional pump modules. As a result of this, even if the fuel pump is miniaturized in accordance with miniaturization of the fuel pump module, the miniaturization of the coupler can be easily and readily achieved without being restricted by the layout depending on the shape of the fuel pump.

[0098] Additionally, since the coupler housing is formed integrally with the conjunction cover, it is possible to prevent the coupler housing from being broken during connection of the coupler and counterpart couplers to each other in comparison with a coupler housing which is, separately from the conjunction cover, formed in a small size. As a result of this, it is possible to connect easily and securely the coupler and the counterpart coupler to each other.

[0099] Furthermore, miniaturization of the fuel pump module can improve flexibility of mounting the fuel pump module to the fuel tank.

[0100] According to yet another invention, the strainer cover of the strainer is divided into the first cover and the second cover, the first cover is formed integrally with the lower case, and the second cover is separated from the lower case. Accordingly, by coupling the first and second covers to each other after insertion of the purifying portion into the first cover, the stability of the strainer can be improved in comparison with the conventional pump modules.

[0101] Furthermore, both the upper case being capped on the lower case and holding the pressure regulator, and the second cover are formed integrally with each other. By the connection between the first cover and the second cover, it is possible to improve the holding power of holding at least one of the fuel pump and the pressure regulator. That is, it is possible to securely prevent at least one of the fuel pump and the pressure regulator from being disconnected. As a result of this, the reliability of the holding the respective parts used in the fuel pump module can be eminently improved.

[0102] Furthermore, since at least one of the fuel pump and the pressure regulator is held by the connection between the first cover and the second cover, it is possible to eliminate the necessity of another holding member from the fuel pump module of the present invention. As a result of this, since the number of parts constituting the fuel pump module decreases, the production cost thereof can be reduced.

Claims

1. A fuel pump module (1; 1'; 1A; 1B; 1C; 1D) having

a reservoir (13 formed on an inner surface of a lower case (2), a fuel passage (6) for guiding fuel accommodated in the reservoir (13) to an engine, a pressure regulator (8) held in the lower case (2) and regulating fuel pressure of the fuel flowing through the fuel passage (6), and an upper case (4; 70) capped on the lower case (2), the fuel pump module comprising

an installing portion (3) integrally made in the lower case (2) and within the reservoir (13); and a pressing portion (5) provided inside the upper case (4; 70) so as to project therefrom, the pressing portion (5) corresponding to the installing portion (3),

characterised in that the pressure regulator (8) is sandwiched between the installing portion (3) and the pressing portion (5).

2. The fuel pump module according to claim 1, wherein an auxiliary passage (7) is provided to connect the installing portion (3) to both of the fuel passage (6) and a strainer (9; 71) for purifying the fuel.

3. The fuel pump module according to claim 1, wherein return fuel from the: pressure regulator (8) held and fixed by the installing portion (3) and the pressing portion (5) is returned to the reservoir (13).

4. The fuel pump module according to claim 1, wherein an auxiliary passage (7) is provided to connect the installing potion (3) to both of the fuel passage (6) and a strainer (9) for purifying the fuel, and return fuel from the pressure regulator (8) held and fixed by the installing portion (3) and the pressing portion (5) is returned to the reservoir (13).

5. The fuel pump module according to any one of claims 1 to 4, wherein a longitudinal direction of the pressure regulator (8) is approximately parallel to an inserting direction of the pressure regulator (8) into the installing portion (3).

6. The fuel pump module according to claim 1, further comprising:

a cover-equipping case (41) provided by forming integrally the upper case and a conjunction cover, the conjunction cover linking one ends of a fuel pump and a strainer (9; 71) which are held by the upper cover, to each other; and
a pump bottom cover (54) for fixing the other end of the fuel pump (19) to the cover-equipping case,

wherein both of the fuel pump (19) and the strainer (9; 71) are linked to a communication passage provided in the conjunction cover (41) by pushing both of the fuel pump (19) and the strainer (2; 71) into the conjunction cover (41).

7. The fuel pump module according to claim 6, wherein the fuel pump (19) has a pump housing, a pump driving portion to be driven in the pump housing, and at least one terminal provided in the pump housing so as to project therefrom and supplying the pump driving portion with a power source;

the conjunction cover (41) includes a cover body, a coupler housing formed integrally with the cover body, and a terminal hole (23) which is formed in the coupler housing and which the terminal is inserted into; and

a coupler to be electrically connected to a counterpart coupler is formed by linking both of the fuel pump (19) and the strainer (9; 71) to the conjunction cover (41) and by inserting the terminal into the terminal hole (23).

8. The fuel pump module according to claim 1, wherein the fuel pump (19) and a fuel-purifying strainer (9; 71) are held in the lower case (2), and a conjunction cover (41) holds both of the fuel pump (19) and the strainer (9; 71) in the upper case (4) and connects the both to each other, the fuel pump (19) being driven by electrically connecting the fuel pump (19) to a counterpart coupler,

the fuel pump (19) has a pump housing and a pump driving portion to be driven in the pump housing;

at least one terminal is provided on the pump housing so as to project therefrom and supplying the pump driving portion with a power source;

a coupler housing is formed integrally with the conjunction cover (41); and

a terminal hole (23) is formed in the coupler housing said terminal being inserted into the terminal hole (23), and

a coupler to be connected to the counterpart coupler is formed by linking both of the fuel pump (19) and the strainer (9; 71) to the conjunction cover (41) and by inserting the terminal into the terminal hole (23).

9. The fuel pump module according to claim 7 or 8, wherein the coupler housing has another engagement portion to be engaged with an engagement portion provided in the counterpart coupler.

10. The fuel pump module according to any one of claims 6 to 8, further comprising a hook-like wire holding portion formed integrally with an outer surface of the conjunction cover.

11. The fuel pump module according to any one of claims 2, 4 and 6 to 8, wherein the strainer (71) has

a purifying portion (72) for purifying the fuel and a strainer cover (73) for covering an outer surface of the purifying portion (72); and

the strainer cover (73) is made of a metal.

12. The fuel pump module according to claim 1, wherein the fuel pump (19) a strainer (71) for purifying fuel, and a pressure regulator (8) for regulating pressure of the fuel are located in the lower case (2),

the strainer (71) has a purifying portion (72) for purifying the fuel, and a strainer cover (73) made of the same material as the lower case (2) and covering an outer surface of the purifying portion (72);

the strainer (73) cover is divided in two such that a first cover (75) which is one is formed integrally with the lower case and a second cover (74) which is the other is separated from the lower case, and

the second cover is welded to the first cover after insertion of the purifying portion (72) into the first cover, and at least one of the fuel pump (19) and the pressure regulator (8) is held in the upper case (70).

13. The fuel pump module according to claim 1, wherein the fuel pump (19), a strainer (71) for purifying fuel, and a pressure regulator (8) for regulating pressure of the fuel are located in the lower case (2),

the strainer (9) has a purifying portion (72) for purifying the fuel, and a strainer cover (73) covering an outer surface of the purifying portion (72),

the strainer cover (71) is divided in two such that a first cover (75) which is one is formed integrally with the lower case (2) and a second cover (74) which is the other is separated from the lower case,

an engagement portion (74) is formed in an end (74a) of the second cover (74b) facing the first cover (75),

another engagement portion (75b) is formed in an end portion (75a) of the first cover (75) facing the second cover (74), and

the engagement portion (74b) is engaged with the another engagement portion (75b) via a sealing member (78) after insertion of the purifying (72) portion into the first cover (75), and at least one of the fuel pump (19) and the pressure regulator (8) is held in the upper case (70).

14. The fuel pump module according to claim 12 or 13, wherein integral formation of the upper case (70) with the second case (2) prevents at least one of the fuel pump (19) and the pressure regulator (8) from being disconnected from the lower case (2).

Patentansprüche

1. Brennstoffpumpenmodul (1; 1'; 1A; 1B; 1C; 1D) mit einem Reservoir (13), das auf einer inneren Oberfläche einer unteren Gehäusehülle (2) ausgebildet ist, einem Brennstoffdurchlass (6) zum Leiten von Brennstoff, der in dem Reservoir (13) aufgenommen ist, zu einer Kraftmaschine, einem Druckregler (8), der in der unteren Gehäusehülle (2) festgehalten wird und Brennstoffdruck des Brennstoffs regelt, der durch den Brennstoffdurchlass (6) strömt, und einer oberen Gehäusehülle (4; 70), die auf der unteren Gehäusehülle (2) als Kappe aufsitzt, wobei das Brennstoffpumpenmodul umfasst:

einen Montageteil (3), der als Einheit in der unteren Gehäusehülle (2) und im Reservoir (13) gefertigt ist; und
einen Pressteil (5), der im Innern der oberen Gehäusehülle (4; 70) so angeordnet ist, dass er davon vorsteht, wobei der Pressteil (5) dem Montageteil (3) entspricht,

dadurch gekennzeichnet, dass der Druckregler (8) zwischen dem Montageteil (3) und dem Pressteil (5) eingefügt ist

2. Brennstoffpumpenmodul nach Anspruch 1, bei dem ein Hilfsdurchlass (7) vorgesehen ist, um den Montageteil (3) mit sowohl dem Brennstoffdurchlass (6) als auch einem Filter (9; 71) zum Reinigen des Brennstoffs zu verbinden.

3. Brennstoffpumpenmodul nach Anspruch 1, bei dem Rücklaufbrennstoff von dem Druckregler (8), der durch den Montageteil (3) und den Pressteil (5) festgehalten und fest angeordnet wird, zum Reservoir (13) rückgeführt wird.

4. Brennstoffpumpenmodul nach Anspruch 1, bei dem ein Hilfsdurchlass (7) vorgesehen ist, um den Montageteil (3) mit sowohl dem Brennstoffdurchlass (6) als auch einem Filter (9) zum Reinigen des Brennstoffs zu verbinden, und Rücklaufbrennstoff von dem Druckregler (8), der durch den Montageteil (3) und den Pressteil (5) festgehalten und fest angeordnet wird, zum Reservoir (13) rückgeführt wird.

5. Brennstoffpumpenmodul nach einem der Ansprüche 1 bis 4, bei dem eine Längsrichtung des Druckreglers (8) ungefähr parallel zu einer Einsatzrichtung des Druckreglers (8) in den Montageteil (3) ist.

6. Brennstoffpumpenmodul nach Anspruch 1, weiter umfassend:

eine Abdeckeinrichtungsgehäusehülle (41), die bereitgestellt wird, dadurch dass die obere

Gehäusehülle und eine Verbindungsabdekkung als Einheit gebildet werden, wobei die Verbindungsabdeckung eines von Enden einer Brennstoffpumpe und eines Filters (9; 71), die durch die obere Abdeckung festgehalten werden, miteinander verbindet; und
eine Pumpenbodenabdeckung (54) zum Befestigen des anderen Endes der Brennstoffpumpe (19) an der Abdeckeinrichtungsgehäusehülle,

wobei sowohl die Brennstoffpumpe (19) als auch der Filter (9; 71) mit einem in der Verbindungsabdeckung (41) vorgesehenen Verbindungsdurchlass verbunden sind, dadurch dass sowohl die Brennstoffpumpe (19) als auch der Filter (9; 71) in die Verbindungsabdeckung (41) geschoben sind.

7. Brennstoffpumpenmodul nach Anspruch 6, bei dem die Brennstoffpumpe (19) aufweist: ein Pumpengehäuse, einen im Pumpengehäuse anzutreibenden Pumpenantriebsteil und mindestens einen Anschluss, der in dem Pumpengehäuse so angeordnet ist, dass er davon vorsteht, und der den Pumpenantriebsteil mit einer Energiequelle versieht;
die Verbindungsabdeckung (41) umfasst: einen Abdeckkörper, ein mit dem Abdeckkörper als Einheit ausgebildetes Kopplergehäuse und eine Anschlussöffnung (23), die in dem Kopplergehäuse ausgebildet ist und in die der Anschluss eingesetzt ist; und
ein mit einem Gegenkoppler elektrisch zu verbindender Koppler gebildet ist, dadurch dass sowohl die Brennstoffpumpe (19) als auch der Filter (9; 71) mit der Verbindungsabdeckung (41) verbunden sind und dadurch dass der Anschluss in die Anschlussöffnung (23) eingesetzt ist.

8. Brennstoffpumpenmodul nach Anspruch 1, bei dem die Brennstoffpumpe (19) und ein Brennstoffreinigungsfilter (9; 71) in der unteren Gehäusehülle (2) festgehalten werden und eine Verbindungsabdekkung (41) sowohl die Brennstoffpumpe (19) als auch den Filter (9; 71) in der oberen Gehäusehülle (4) festhält und die beiden miteinander verbindet, wobei die Brennstoffpumpe (19) angetrieben wird, dadurch dass die Brennstoffpumpe (19) mit einem Gegenkoppler elektrisch verbunden wird,
die Brennstoffpumpe (19) ein Pumpengehäuse und einen im Pumpengehäuse anzutreibenden Pumpenantriebsteil aufweist;
mindestens ein Anschluss auf dem Pumpengehäuse so angeordnet ist, dass er davon vorsteht, und der den Pumpenantriebsteil mit einer Energiequelle versieht;
ein Kopplergehäuse mit der Verbindungsabdeckung (41) als Einheit ausgebildet ist; und
eine Anschlussöffnung (23) im Kopplergehäuse ausgebildet ist, wobei der Anschluss in die Anschlussöffnung (23) eingesetzt ist, und
ein mit dem Gegenkoppler zu verbindender Koppler gebildet ist, dadurch dass sowohl die Brennstoffpumpe (19) als auch der Filter (9; 71) mit der Verbindungsabdeckung (41) verbunden sind und dadurch dass der Anschluss in die Anschlussöffnung (23) eingesetzt ist.

9. Brennstoffpumpenmodul nach Anspruch 7 oder 8, bei dem das Kopplergehäuse einen anderen Eingriffsteil aufweist, der mit einem Eingriffsteil in Eingriff zu bringen ist, der in dem Gegenkoppler vorgesehen ist.

10. Brennstoffpumpenmodul nach einem der Ansprüche 6 bis 8, weiter umfassend einen hakenartigen Drahthalteteil, der mit einer äußeren Oberfläche der Verbindungsabdeckung als Einheit ausgebildet ist.

11. Brennstoffpumpenmodul nach einem der Ansprüche 2, 4 und 6 bis 8, bei dem der Filter (71) einen Reinigungsteil (72) zum Reinigen des Brennstoffs und eine Filterumhüllung (73) zum Umhüllen einer äußeren Oberfläche des Reinigungsteils (72) aufweist; und
die Filterumhüllung (73) aus einem Metall hergestellt ist.

12. Brennstoffpumpenmodul nach Anspruch 1, bei dem die Brennstoffpumpe (19), ein Filter (71) zum Reinigen von Brennstoff und ein Druckregler (8) zum Regeln von Druck des Brennstoffs in der unteren Gehäusehülle (2) lokalisiert sind,
der Filter (71) aufweist: einen Reinigungsteil (72) zum Reinigen des Brennstoffs und eine Filterumhüllung (73), die aus demselben Material wie die untere Gehäusehülle (2) hergestellt ist und eine äußere Oberfläche des Reinigungsteils (72) umhüllt;
die Filter(73)umhüllung zweigeteilt ist, so dass eine erste Umhüllung (75), die eine ist, mit der unteren Gehäusehülle als Einheit ausgebildet ist, und eine zweite Umhüllung (74), die die andere ist, von der unteren Gehäusehülle separiert ist, und
die zweite Umhüllung an der ersten Umhüllung nach Einsetzen des Reinigungsteils (72) in die erste Umhüllung geschweißt wird, und mindestens eines von der Brennstoffpumpe (19) und dem Druckregler (8) in der oberen Gehäusehülle (70) festgehalten wird.

13. Brennstoffpumpenmodul nach Anspruch 1, bei dem die Brennstoffpumpe (19), ein Filter (71) zum Reinigen von Brennstoff und ein Druckregler (8) zum Regeln von Druck des Brennstoffs in der unteren Gehäusehülle (2) lokalisiert sind,
der Filter (9) aufweist: einen Reinigungsteil (72) zum Reinigen des Brennstoffs und eine Filter-

umhüllung (73), die eine äußere Oberfläche des Reinigungsteils (72) umhüllt,

die Filterumhüllung (71) zweigeteilt ist, so dass eine erste Umhüllung (75), die eine ist, mit der unteren Gehäusehülle (2) als Einheit ausgebildet ist, und eine zweite Umhüllung (74), die die andere ist, von der unteren Gehäusehülle separiert ist,

ein Eingriffsteil (74b) in einem Ende (74a) der zweiten Umhüllung (74b) ausgebildet ist, wobei er der ersten Umhüllung (75) gegenüberliegt,

ein anderer Eingriffsteil (75b) in einem Endteil (75a) der ersten Umhüllung (75) ausgebildet ist, wobei er der zweiten Umhüllung (74) gegenüberliegt, und

der Eingriffsteil (74b) mit dem anderen Eingriffsteil (75b) über ein Abdichtelement (78) nach Einsetzen des Reinigungs(72)teils in die erste Umhüllung (75) in Eingriff tritt, und mindestens eines von der Brennstoffpumpe (19) und dem Druckregler (8) in der oberen Gehäusehülle (70) festgehalten wird.

14. Brennstoffpumpenmodul nach Anspruch 12 oder 13, bei dem eine als Einheit ausgeführte Ausbildung der oberen Gehäusehülle (70) mit der zweiten Gehäusehülle (2) verhindert, dass mindestens eines von der Brennstoffpumpe (19) und dem Druckregler (8) von der unteren Gehäusehülle (2) getrennt wird.

Revendications

1. Module (1 ; 1' ; 1A ; 1B ; 1C ; 1D) de pompe à carburant comportant une retenue (13) formée sur une surface intérieure d'un carter inférieur (2), un passage (6) de carburant servant à guider du carburant reçu dans la retenue (13) vers un moteur, un régulateur (8) de pression maintenu dans le carter inférieur (2) et régulant une pression de carburant du carburant qui s'écoule à travers le passage (6) de carburant, et un carter supérieur (4 ; 70) recouvrant le carter inférieur (2), le module de pompe à carburant comprenant :

une partie (3) d'installation réalisée d'un seul tenant dans le carter inférieur (2) et à l'intérieur de la retenue (13) ; et
une partie (5) d'application de pression disposée à l'intérieur du carter supérieur (4 ; 70) de façon à en faire saillie, la partie (5) d'application de pression correspondant à la partie (3) d'installation,

caractérisé en ce que le régulateur (8) de pression est pris en sandwich entre la partie (3) d'installation et la partie (5) d'application de pression.

2. Module de pompe à carburant selon la revendication 1, dans lequel un passage auxiliaire (7) est prévu pour relier la partie (3) d'installation à la fois au passage (6) de carburant et à une crépine (9 ; 71) servant à purifier le carburant.

3. Module de pompe à carburant selon la revendication 1, dans lequel le carburant renvoyé du régulateur (8) de pression, maintenu sur la partie (3) d'installation et sur la partie (5) d'application de pression, et fixé par celles-ci, est renvoyé vers la retenue (13).

4. Module de pompe à carburant selon la revendication 1, dans lequel un passage auxiliaire (7) est prévu pour relier la partie (3) d'installation à la fois au passage (6) de carburant et à une crépine (9) servant à purifier le carburant, et dans lequel le carburant de renvoi provenant du régulateur (8) de pression maintenu sur la partie (3) d'installation et la partie (5) d'application de pression, et fixé par celles-ci, est renvoyé vers la retenue (13).

5. Module de pompe à carburant selon l'une quelconque des revendications 1 à 4, dans lequel une direction longitudinale du régulateur (8) de pression est sensiblement parallèle à un sens d'introduction du régulateur (8) de pression dans la partie (3) d'installation.

6. Module de pompe à carburant selon la revendication 1, comprenant en outre :

un carter (41) d'habillage formant couvercle obtenu par formation d'un seul tenant du carter supérieur et d'un couvercle de conjonction, le couvercle de conjonction reliant l'une à l'autre l'une des extrémités d'une pompe à carburant et d'une crépine (9 ; 71) qui sont maintenues par le couvercle supérieur ; et
un couvercle inférieur (64) de pompe servant à fixer l'autre extrémité de la pompe à carburant (19) au carter d'habillage formant couvercle,

dans lequel la pompe à carburant (19) et la crépine (9 ; 71) sont toutes les deux reliées à un passage de communication réalisé dans le couvercle (41) de conjonction par la poussée à la fois de la pompe à carburant (19) et de la crépine (9 ; 71) dans le couvercle (41) de conjonction.

7. Module de pompe à carburant selon la revendication 6, dans lequel la pompe à carburant (19) comporte un boîtier de pompe, une partie d'entraînement de pompe devant être entraînée dans le boîtier de pompe, et au moins une borne disposée dans le boîtier de pompe de façon à en faire saillie et à délivrer une source de puissance à la partie d'entraînement de pompe ;

le couvercle (41) de conjonction inclut un corps de couvercle, un boîtier de coupleur formé d'un seul tenant avec le corps de couvercle, et un trou (23) de borne qui est formé dans le boîtier de coupleur, et dans lequel est introduit la borne ; et

un coupleur à connecter électriquement à un coupleur complémentaire est formé par liaison à la fois de la pompe à carburant (19) et de la crépine (9 ; 71) au couvercle (41) de conjonction et par introduction de la borne dans le trou (23) de borne.

8. Module de pompe à carburant selon la revendication 1, dans lequel la pompe à carburant (19) et une crépine (9 ; 71) de purification de carburant sont maintenues dans le carter inférieur (2), et un couvercle (41) de conjonction maintient à la fois la pompe à carburant (19) et la crépine (9 ; 71) dans le carter supérieur (4) et les met en communication l'une avec l'autre, la pompe à carburant (19) étant entraînée par connexion électrique de la pompe à carburant (19) à un coupleur complémentaire,

la pompe à carburant (19) comporte un boîtier de pompe et une partie d'entraînement de pompe devant être entraînée dans le boîtier de pompe ;

au moins une borne (15) disposée sur le boîtier de pompe de façon à en faire saillie et à délivrer une source de puissance à la partie d'entraînement de pompe ;

un boîtier (15) de coupleur formé d'un seul tenant avec le couvercle (41) de conjonction ; et

un trou (23) de borne est formé dans le boîtier de coupleur, ladite borne étant introduite dans le trou (23) de borne, et

un coupleur à connecter à un coupleur complémentaire est formé par liaison à la fois de la pompe à carburant (19) et de la crépine (9 ; 71) au couvercle (41) de conjonction et par introduction de la borne dans le trou (23) de borne.

9. Module de pompe à carburant selon la revendication 7 ou 8, dans lequel le boîtier de coupleur comporte une autre partie d'engagement devant s'engager avec une partie d'engagement réalisée dans le coupleur complémentaire.

10. Module de pompe à carburant selon l'une quelconque des revendications 6 à 8, comprenant en outre une partie de maintien par fil de type crochet formée d'un seul tenant avec une surface extérieure du couvercle de conjonction.

11. Module de pompe à carburant selon l'une quelconque des revendications 2, 4 et 6 à 8, dans lequel la crépine (71) comporte une partie (72) de purification servant à purifier le carburant et un couvercle (73) de crépine servant à couvrir une surface extérieure de la partie (72) de purification ; et

le couvercle (73) de crépine est réalisé en métal.

12. Module de pompe à carburant selon la revendication 1, dans lequel la pompe à carburant (19), une crépine (71) servant à purifier du carburant, et un régulateur (8) de pression servant à réguler une pression du carburant sont situés dans le carter inférieur (2) ;

la crépine (71) comporte une partie (72) de purification servant à purifier le carburant, et un couvercle (73) de crépine réalisé dans le même matériau que le carter inférieur (2) et couvrant une surface extérieure de la partie (72) de purification ;

le couvercle (73) de crépine est divisé en deux de sorte qu'un premier couvercle (75) qui constitue une première partie est formé d'un seul tenant avec le carter inférieur et qu'un second couvercle (74) qui constitue l'autre partie est séparé du carter inférieur, et

le second couvercle est soudé au premier couvercle après introduction de la partie (72) de purification dans le premier couvercle, et au moins l'un de la pompe à carburant (19) et du régulateur (8) de pression est maintenu dans le carter supérieur (70).

13. Module de pompe à carburant selon la revendication 1, dans lequel la pompe à carburant (19), une crépine (71) servant à purifier du carburant et un régulateur (8) de pression servant à réguler une pression du carburant sont situés dans le carter inférieur (2),

la crépine (9) comporte une partie (72) de purification servant à purifier le carburant, et un couvercle (73) de crépine couvrant une surface extérieure de la partie (72) de purification,

le couvercle (71) de crépine est divisé en deux de sorte qu'un premier couvercle (75) qui constitue une première partie est formé d'un seul tenant avec le carter inférieur (2) et qu'un second couvercle (74) qui constitue l'autre partie est séparé du carter inférieur,

une partie (74b) d'engagement est formée dans une extrémité (74a) du second couvercle (74b) faisant face au premier couvercle (75),

une autre partie (75b) d'engagement formée dans une partie (75a) d'extrémité du premier couvercle (75) faisant face au second couvercle (74), et

la partie (74b) d'engagement engage l'autre partie (75b) d'engagement via un élément (78) d'étanchéité après introduction de la partie (72) de purification dans le premier couvercle (75), et au moins l'un de la pompe à carburant (19) et du régulateur (8) de pression est maintenu dans le carter supérieur (70).

14. Module de pompe à carburant selon la revendication 12 ou 13, dans lequel la formation d'une seule

pièce du carter supérieur (70) avec le second carter (2) empêche qu'au moins l'un de la pompe à carburant (19) et du régulateur (8) de pression se déconnecte du carter inférieur (2).

Fig. 1

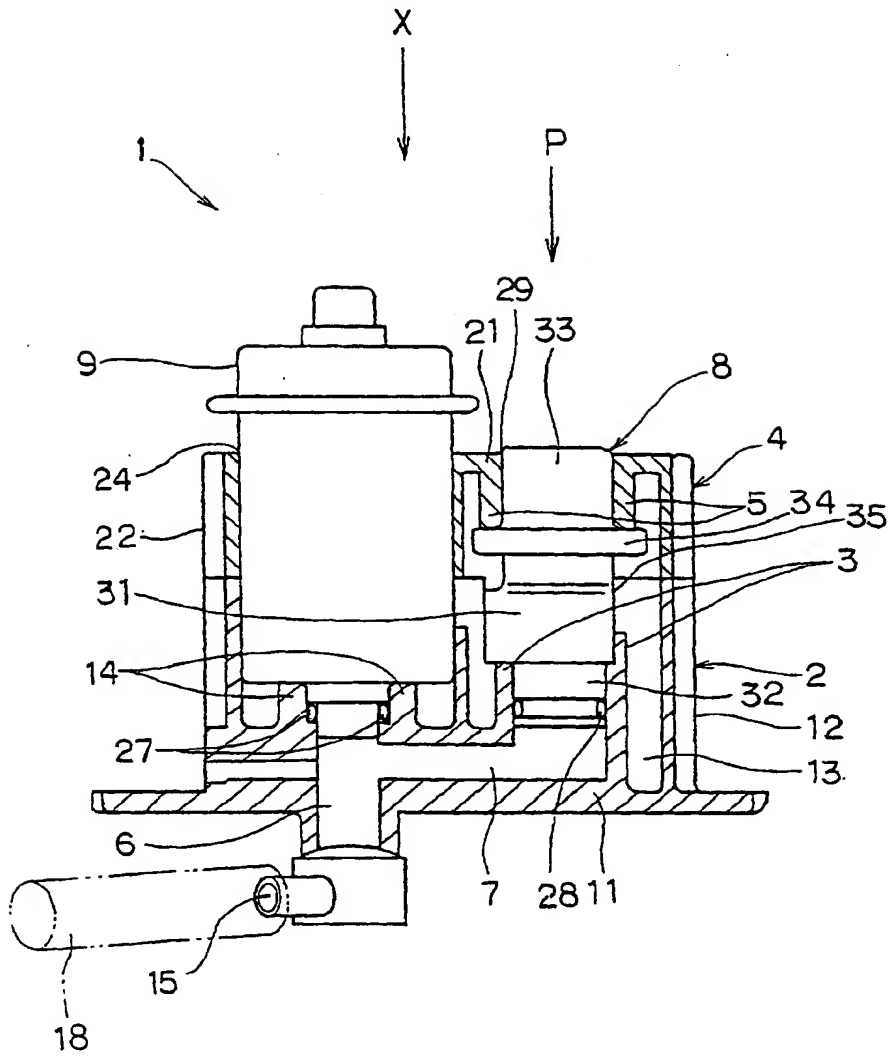

Fig. 2

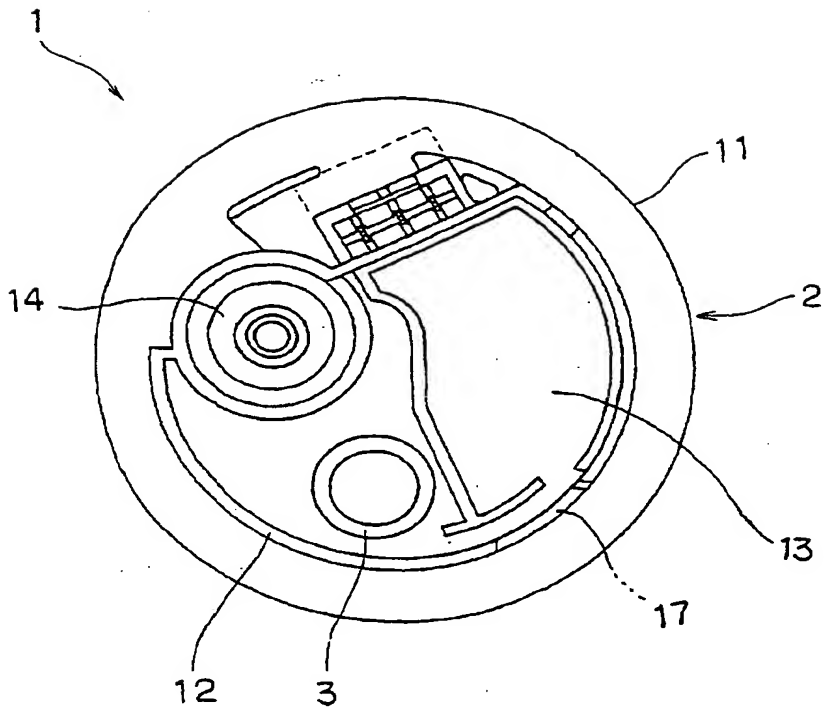

Fig. 3

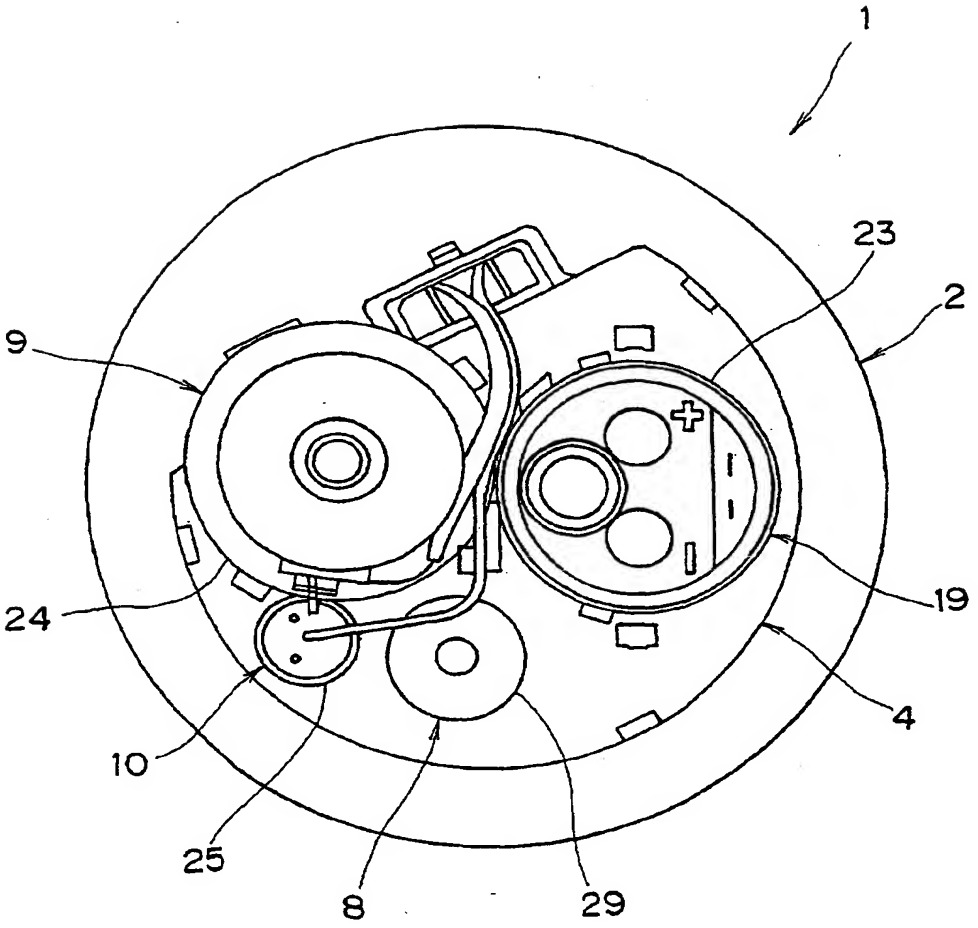

Fig. 4

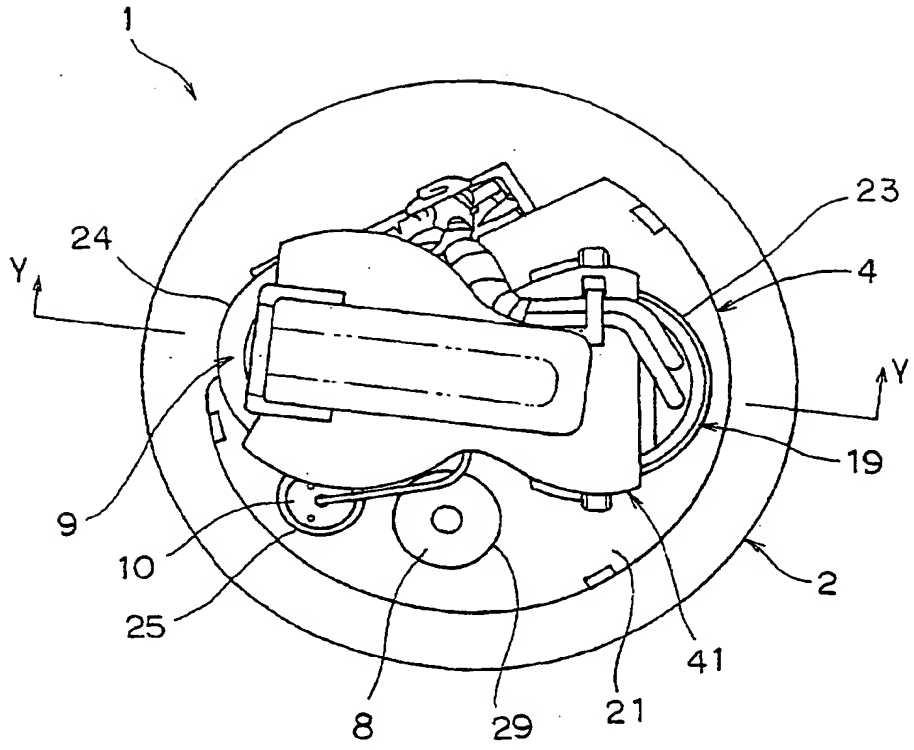

Fig. 5

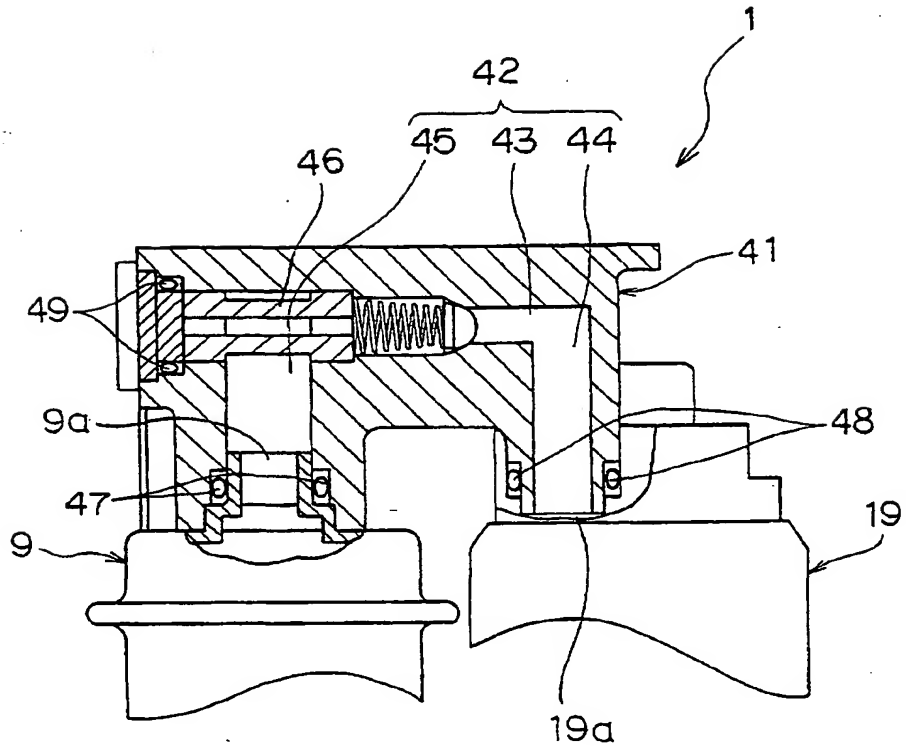

Fig. 6

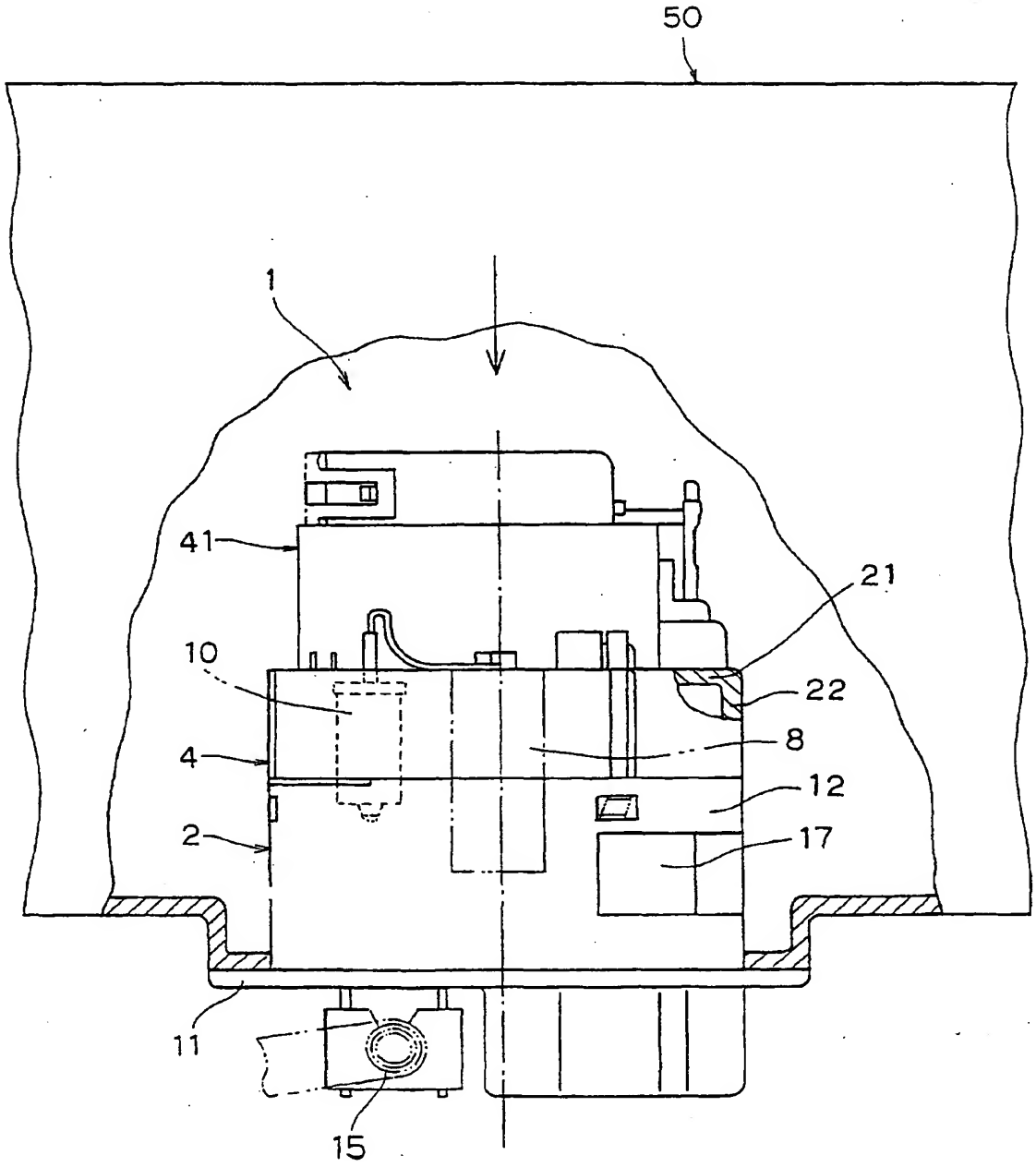

Fig. 7

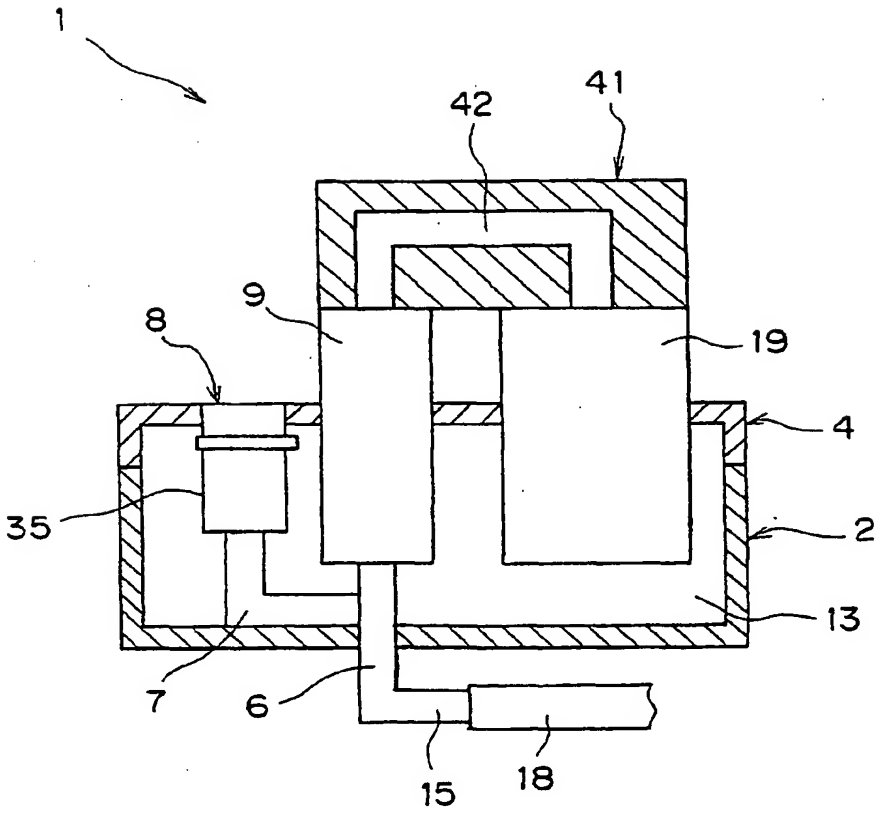

Fig. 8

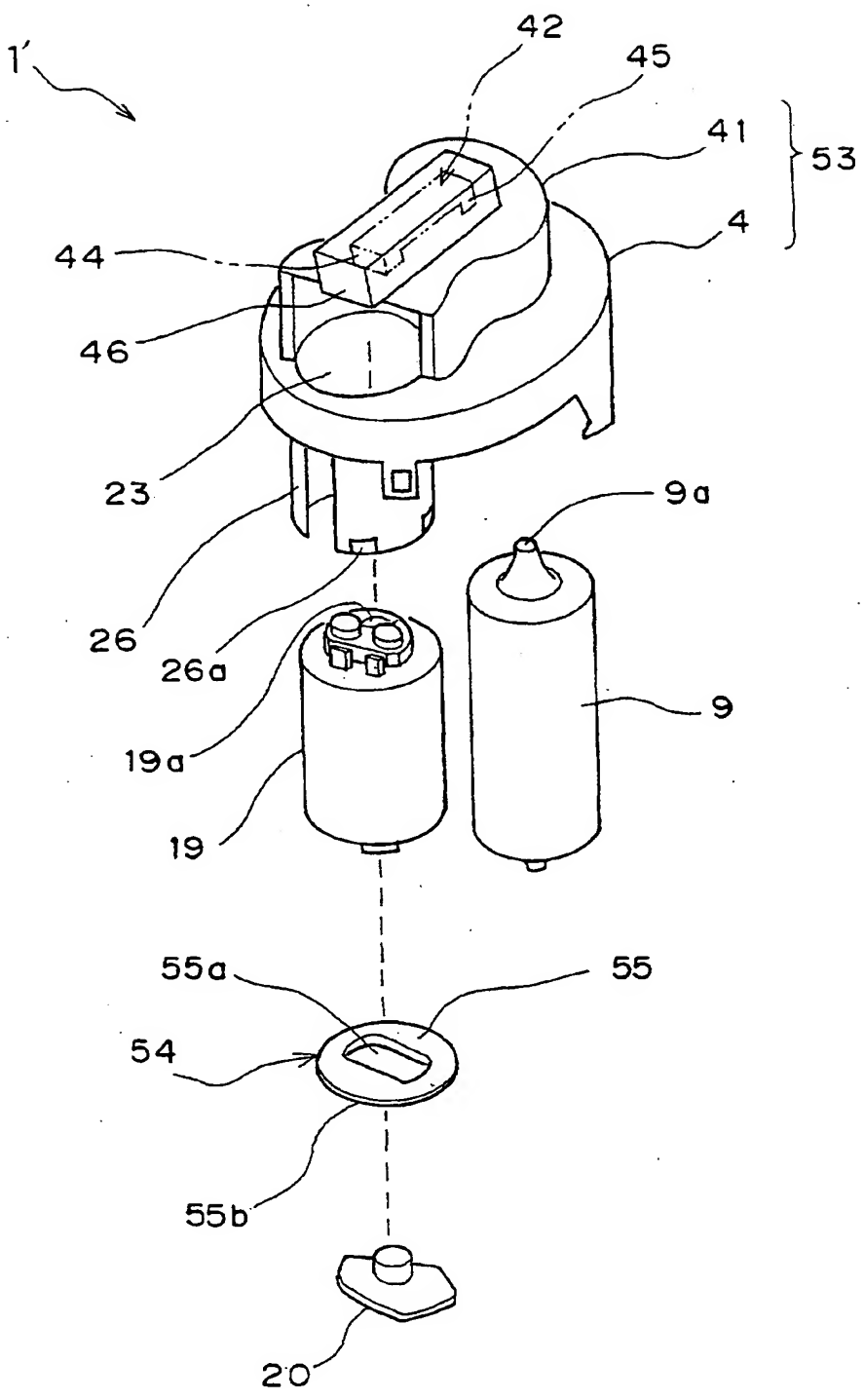

Fig. 9

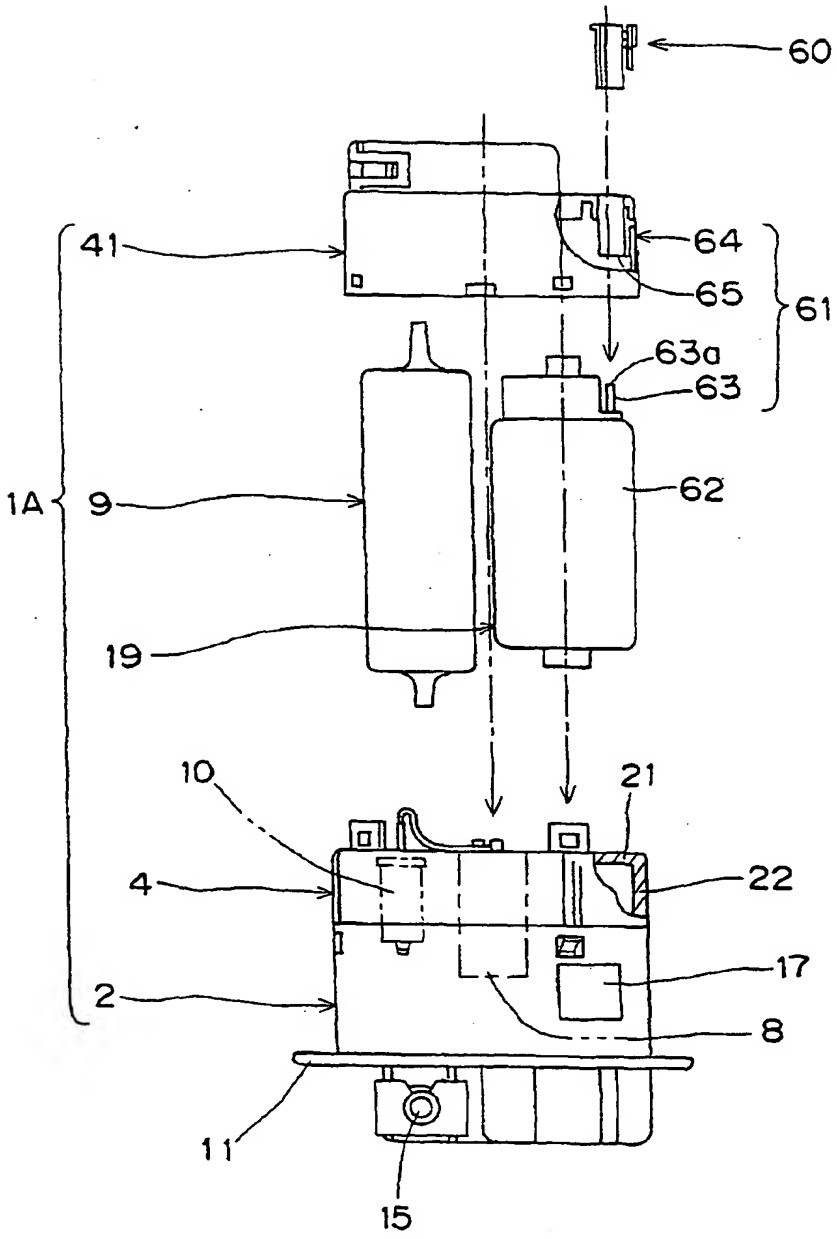

Fig. 10

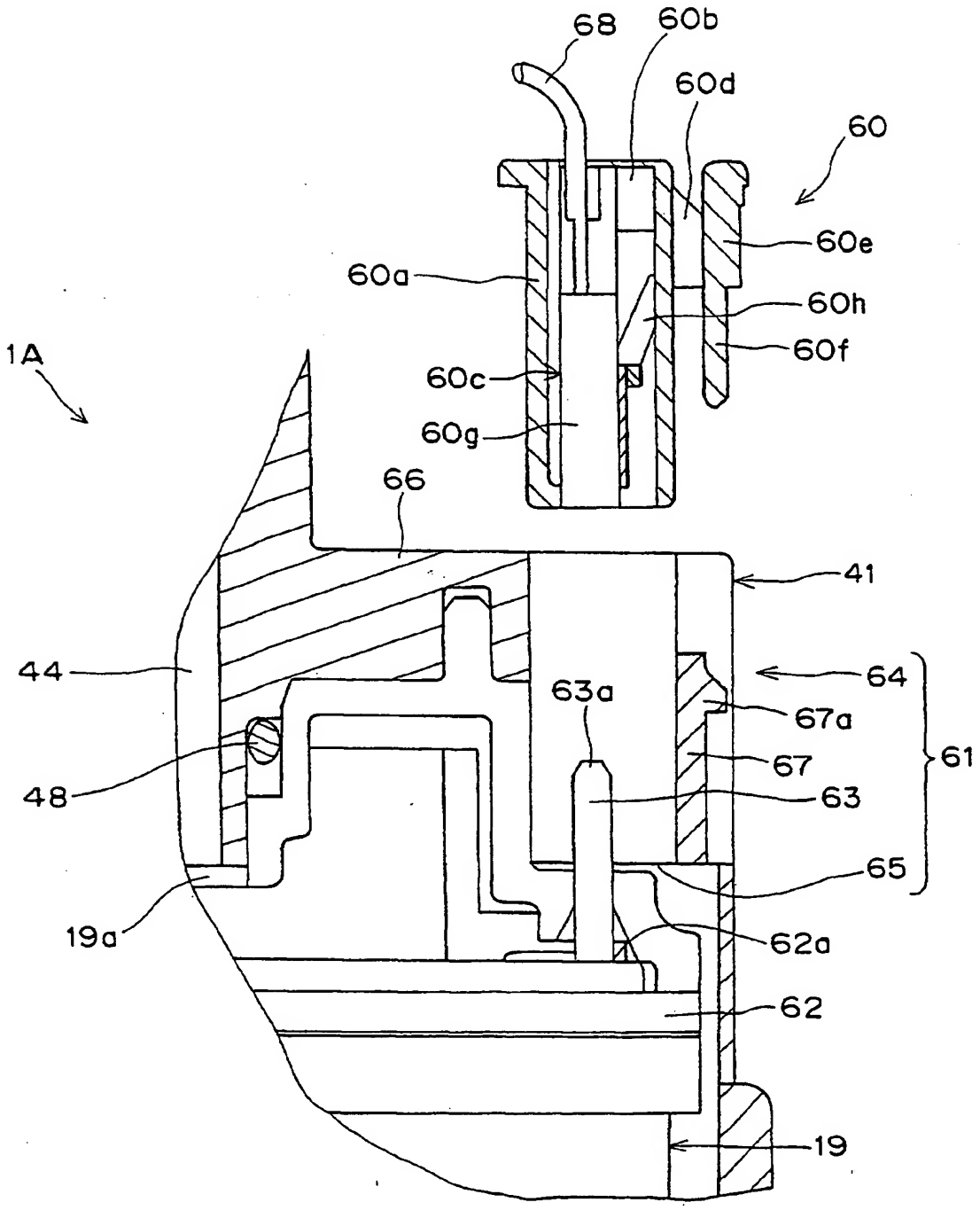
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Fig. 11

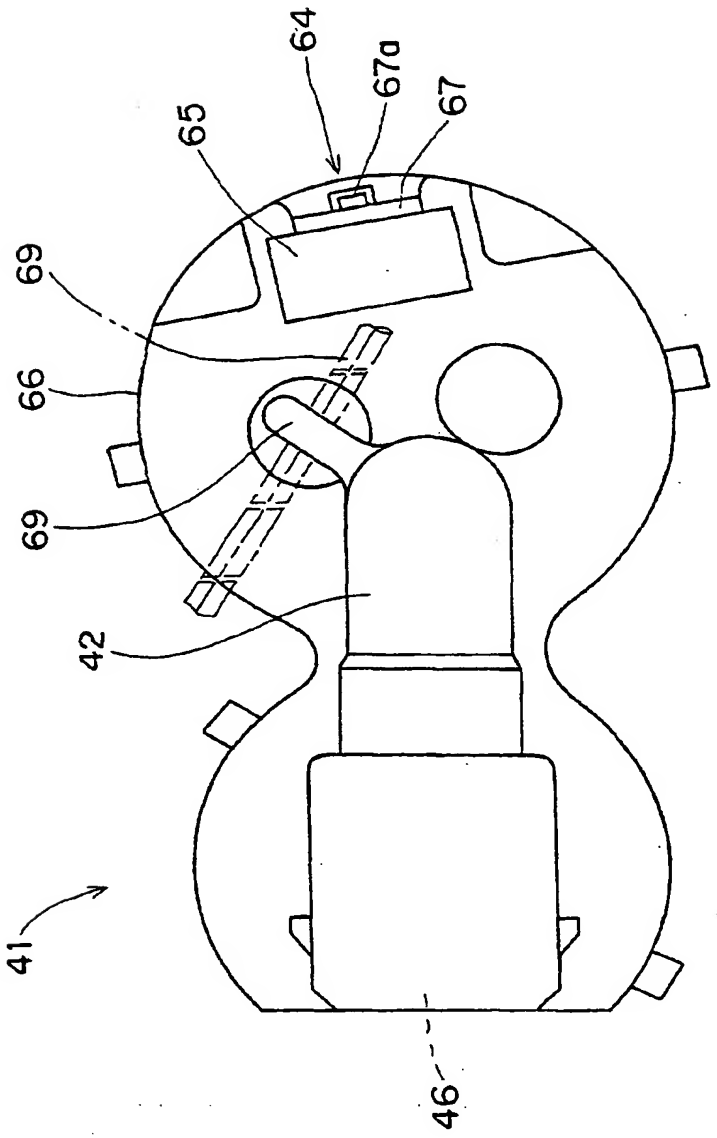

Fig.12

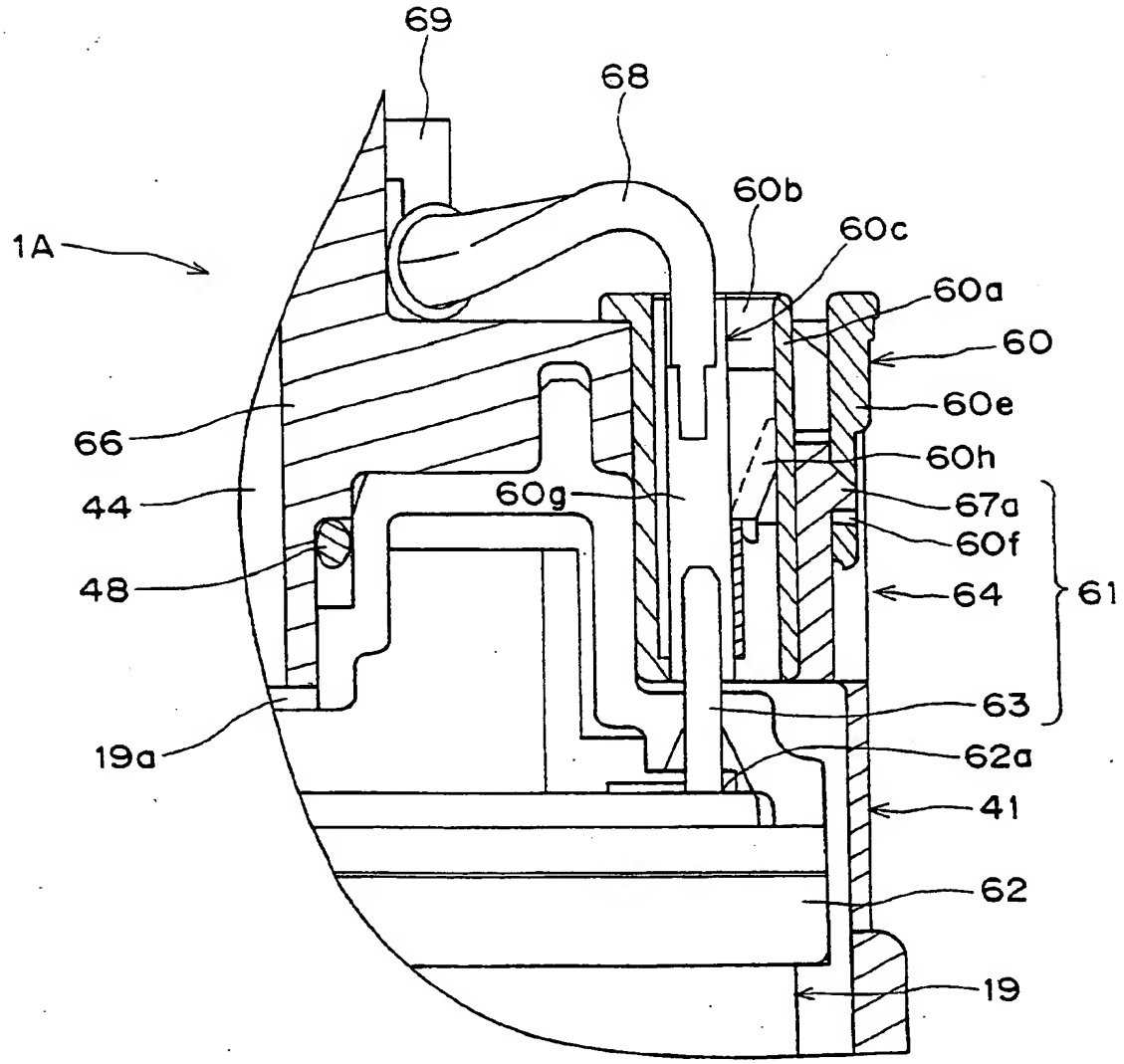
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Fig. 13

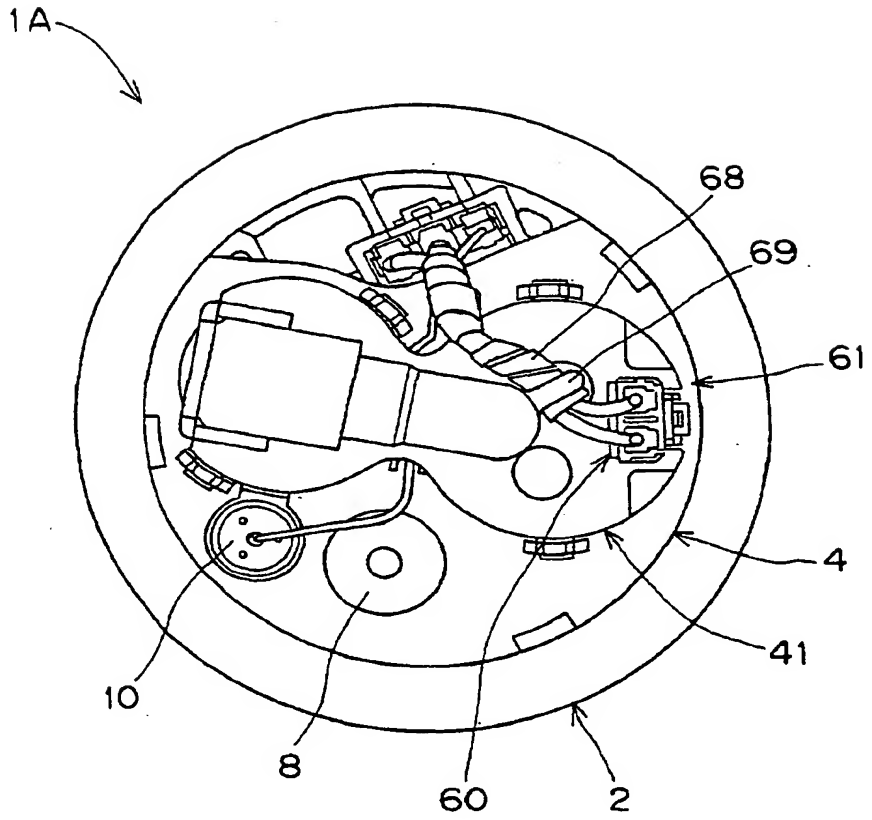

Fig. 14

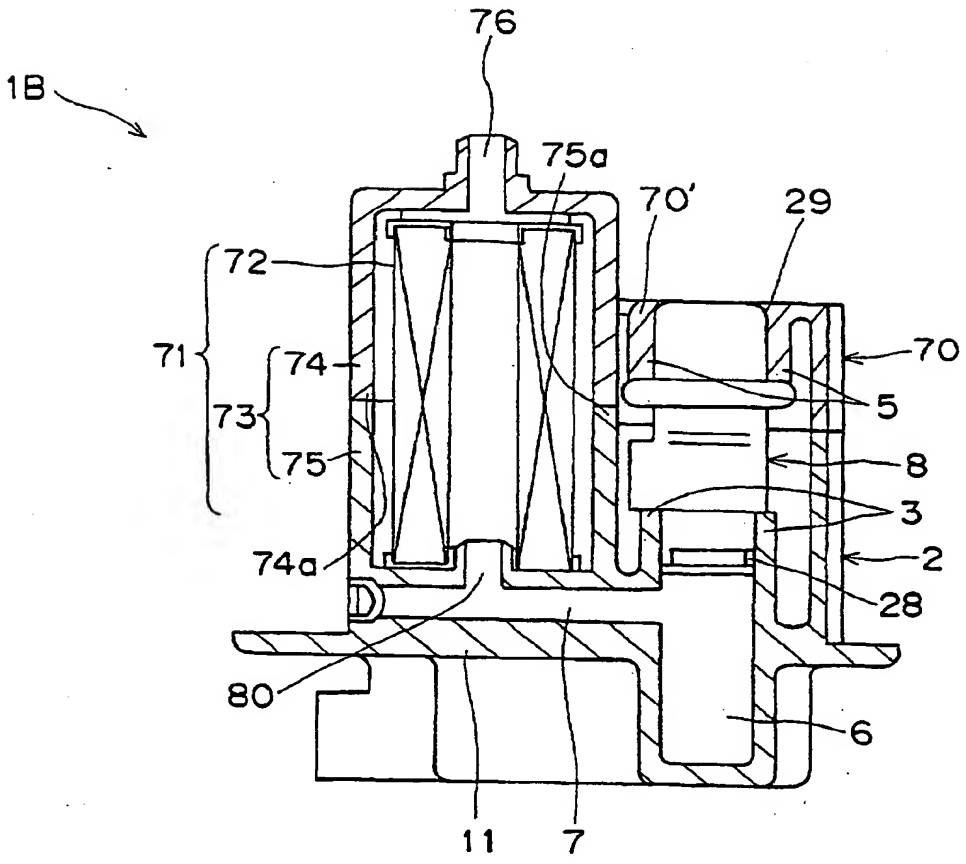

Fig. 15

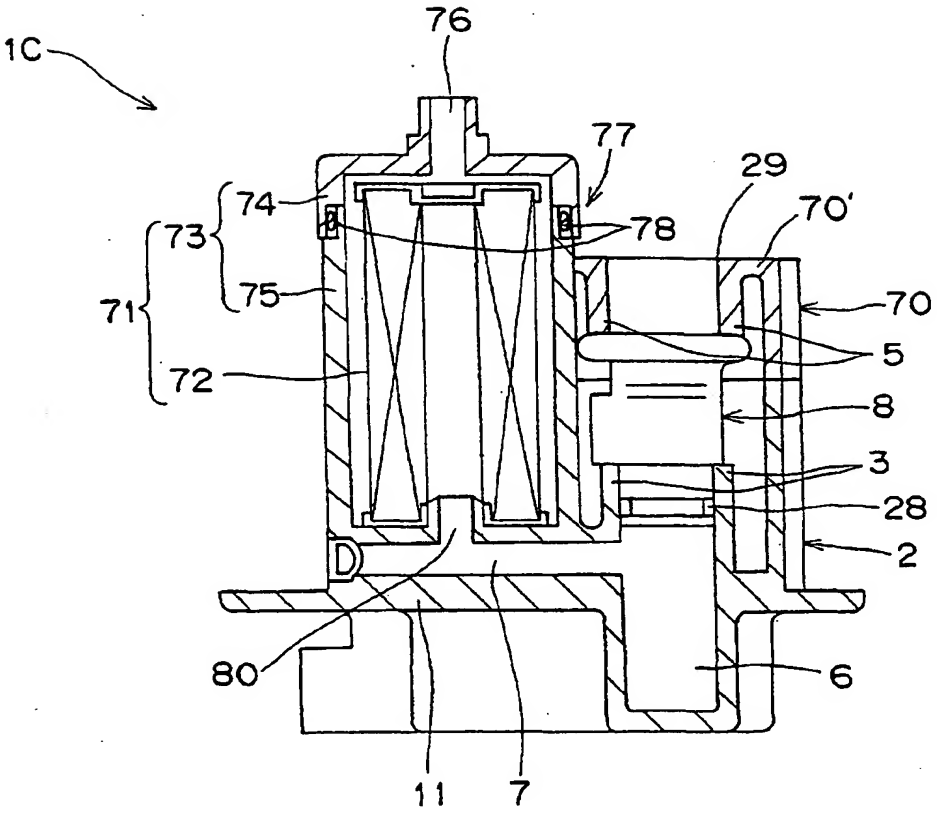

Fig. 16

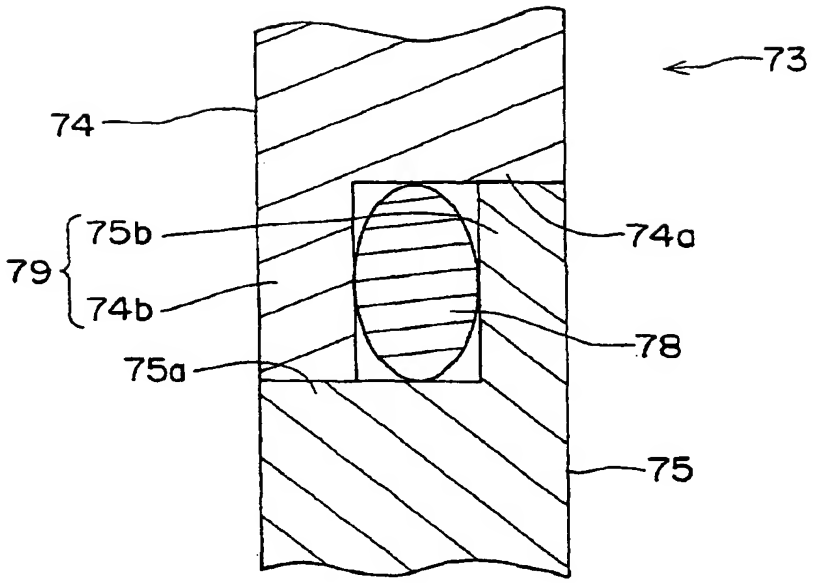

Fig.17